

Department of Enterprise Services WA State Governor's Mansion Energy Services Proposal

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Contents

SECTION 1. EXECUTIVE SUMMARY

- 1.1 Overview
- 1.2 Project Description
- 1.3 Summary of Benefits
- 1.4 Guarantees
- 1.5 Conclusion

SECTION 2. SCOPE OF WORK

- 2.1 Facility Improvement Measure (FIM) Summary
- 2.2 ESCO Services
- 2.3 Extent of Subcontracting
- 2.4 Project Schedule
- 2.5 Attachment A Detailed Scope of Work

SECTION 3. ENERGY COST SAVINGS AND GUARANTEES

- 3.1 Guarantee Overview
- 3.2 FIM Specific Performance Assurance Methodology
- 3.3 Utility Rates
- 3.4 Standards of Comfort Service
- 3.5 On-Going Owner Responsibilities
- 3.6 Non-Performance
- 3.7 Change of Use
- 3.8 Owner Furnished Equipment
- 3.9 Table 3.1 Energy Savings Guarantee Summary
- 3.10 Table 3.2 Performance Assurance Plan Outline
- 3.11 Table 3.3 Utility Base Rates

SECTION 4. PROJECT FINANCIALS

- 4.1 Maximum Project Allowable Cost
- 4.2 Project Cost Table
- 4.3 Items Included in Maximum Project Cost
- 4.4 Construction Contingency
- 4.5 Allowances
- 4.6 On-Going Services
- 4.7 Accounting Records
- 4.8 Reconciliation of Labor & Material Costs
- 4.9 ESCO Compensation
- 4.10 Financing
- 4.11 Termination Value
- 4.12 Terms of Agreement
- 4.13 Insurance & Bonding
- 4.14 Table 4.1 Budget Summary Breakdown
- 4.15 Table 4.2 FIM Matrix

SECTION 5. DIRECTED ENERGINEERING STUDY (DES)

- 5.1 Purpose and Organization
- 5.2 Existing Facility Description
- 5.3 Facility Improvement Measures Calculations
- 5.4 Facility Improvement Measures Additional Scope Documents
- 5.5 FIMs Considered But Not Used
- 5.6 Utility Data
- 5.7 HVAC System Data & Test Trends
- 5.8 August 2013 Investment Grade Audit Update Report



Executive Summary

1.1 Overview

McKinstry Essention (herein after as McKinstry) is pleased to present this proposal for the implementation of energy efficiency measures at the Governor's Mansion in Olympia, WA.

This proposal follows the outline contained in Section 2 of the Energy Services Agreement. It presents the contractual terms under which McKinstry and the WA Department of Energy Services (DES) Energy Program will work together over the term of the project. This Proposal describes the scope, costs, guarantees, and other aspects of the project.

The services included in this proposal include design, construction, and system verification. Although WA DES will operate and maintain the new equipment, McKinstry will provide an initial commissioning of the systems installed and will provide commissioning documentation of system operation and performance, proving the ability to realize the necessary savings.

1.2 Project Description

This project includes renovations to the existing HVAC, controls, and lighting systems for WA Governor's Mansion. It includes disconnecting the Mansion from the Campus steam systems and providing independent heating hot water and domestic water heating for the facility. The Mansion's dependence on the Campus chilled water system will also be optimized to utilize stored chilled water and minimize the need to run the Chiller Plant to serve afterhours demand from the Mansion. Feedback from internal loads will be used to optimize ventilation rates. Additionally, the interior and exterior lighting will be retrofite to lower energy consumption.

1.3 Summary of Benefits

FINANCIAL BENEFITS

Section 4 of the proposal provides information related to specific project financials related to this project. The guaranteed maximum project allowable cost is \$683,002. Including sales tax and Engineering & Architectural Services (E&AS) management fees, and before any utility incentives, the final project cost is estimated at \$785,152. The estimated utility rebate from the Utility is approximately \$31,138.

The improvements are projected to produce over \$12,443 of annual energy savings to WA DES. Savings of \$839 / year are projected based on a reduced repair costs and future avoided capital expenditures as agreed upon with WA DES. Total first year savings is estimated at \$13,282 annually. The estimated simple payback for this project is 56.8 years. Energy savings will be significantly improved with campus steam optimization. These savings have not been accounted for on this project.

This project is a crucial first step to reduce summer load on the steam system, and allow development of the steam system optimization. Additional energy savings will be realized by the Campus at that time, but are not included in the project financial analysis at this time. However, a summer shutdown of the steam plant is not achievable unless the heating and domestic hot water loads of the Governor's Mansion are removed from the existing Campus steam system.

EMISSIONS SUMMARY

The energy savings produced will directly reduce the amount of power produced by the utility. To compute the environmental impact, McKinstry uses factors from eGRID2007 Version 1.1. The Emissions & Generation Resource Integrated Database (eGRID) is a comprehensive source of data on the environmental characteristics of electric power generated in the United States. Factors for non-electric utility savings were obtained from the US EPA.



Executive Summary

On average, one car produces 11,470 pounds of CO2 annually and one acre of trees absorbs 8,066 pounds of CO2 annually. By implementing this building improvement, CO2 emissions will be reduced by 254,547 pounds annually, which is equivalent to removing 22 cars from the road or planting 32 acres of trees.

1.4 Guarantees

McKinstry guarantees that the project cost, related specifically to the project scope defined herein, will not exceed the maximum price of \$624,795. This excludes sales tax, WA DES management fees, and before any utility incentives.

1.5 Conclusion

This project represents an excellent opportunity for WA DES to greatly improve its facilities while saving energy. McKinstry looks forward to working with WA DES in making this project a success.



Scope of Work

2.1 Facility Improvement Measure (FIM) Summary

For detailed scope of work descriptions please refer to Section 2, Attachment A - "Detailed Scope of Work."

2.2 ESCO Services

McKinstry will include the following services related to this project:

- 1. Energy Audit: The energy audit is complete and is submitted under Section 5 "Detailed Engineering Study."
- 2. Design Services: McKinstry will provide a detailed engineering design as needed to obtain permitting, Owner review, approval of the proposed systems, and to obtain competitive bids. In addition, McKinstry will also provide construction support services, start-up, testing, as-built drawings of systems installed, and provide relevant operations and maintenance manuals.
- 3. Construction: Provide, or cause to be provided, all material, labor, and equipment, including paying for permits, fees, bonds, and insurance, required for the complete and working installation of McKinstry's equipment.
 - a. McKinstry will provide a site superintendent who will be responsible for the onsite supervision and coordination of trades and subcontractors. This individual's responsibilities will also include regular work observations, quality control, site security, enforcement of the site-specific safety plan, as well as coordinating any impact upon building tenants with the Owner.
 - b. McKinstry may perform portions of the construction work with the approval of the Owner and the DES Project Manager or may subcontract portions to qualified firms. In either case, McKinstry will share information regarding actual costs of the work with the Owner and the DES Energy Program.
 - c. When McKinstry has completed the installation of the equipment, including start-up, operations verification, and training in accordance with the proposal, McKinstry will provide to Owner and the DES Project Manger a "Notice of Commencement of Energy Savings."
 - d. At the conclusion of the project, McKinstry will submit a "Notice of Substantial Completion" to the Owner and the DES Project Manager.
- 4. Construction Management: McKinstry will provide a dedicated construction manager who will provide contract administration services for the project. The Owner is expected to coordinate dayto-day communications with tenants and any scheduling of tenant relocations in and around occupied areas.
- 5. Operation Training: McKinstry will provide training of building staff during construction and a minimum of 2-4 hours of training on the energy management control system.
- 6. Performance Maintenance: McKinstry will provide one-time measurement and support services to ensure that predicted savings are achieved throughout the term of the agreement. On-going services shall be under separate agreement. On-going services shall be at the discretion of the Owner and the DES Project Manager to terminate. Specific tasks associated with proposed ongoing performance assurance tasks can be found in Table 3.2.
- 7. Equipment Maintenance: McKinstry will provide no equipment maintenance or repairs after the warranty period. Following the completion of the installation and acceptance by the Owner and the DES Project Manager of the Equipment, the Owner shall provide all necessary service, repairs, and adjustments to the Equipment so that the Equipment will perform in the manner and to the extent set forth in the proposal. McKinstry shall have no obligation to service or maintain the Equipment after the warranty period.



Scope of Work

- 8. Warranty: McKinstry will warrant equipment for one year following Notice of Substantial Completion. Specific information regarding equipment warranty will be passed on to Owner and DES Project Manager.
- 9. Hazardous Waste other than PCB lighting ballasts: Should the project require removal or disposal of hazardous material, McKinstry may have the hazardous material or substances removed and disposed of at the request of the Owner. McKinstry typically does not assume ownership of the material but may act on behalf of the Owner to properly remove and dispose of the material. As hazardous materials have not been identified during the Detailed Engineering Study, these costs are not included in the guaranteed maximum cost. The Owner agrees and acknowledges that it has not relied on or employed McKinstry to analyze or identify the presence of any hazardous substance on the Owner's premises. The cost of hazardous material abatement and disposal is not included in this proposal.
- 10. Hazardous Waste associated with PCB lighting ballasts: Where PCB ballasts are discovered as part of lighting retrofit work, McKinstry shall dispose of PCB ballasts through an approved hazardous waste vendor. The cost of hazardous material abatement and disposal associated with PCB ballasts is included in this proposal.

2.3 Extent of Subcontracting

McKinstry may subcontract the energy audit, design, construction management, start-up, and training portions of this Contract to qualified firms upon review and approval by Owner and DES Project Manager. Construction subcontracts will be awarded competitively or as directed by the Owner. McKinstry will endeavor to satisfy the MWBE goals of Washington State.

2.4 Project Schedule

The following information lists several milestone dates for the project. McKinstry will develop a detailed schedule outlining all of the various design, pre-construction, construction, and closeout tasks associated with the project and that interfaces with other construction work not under this proposal.

	START	FINISH
ESP Review and Approval Process	11/13	03/14
Contract Routing	03/14	04/14
McKinstry Design and Pre-Construction	05/14	07/14
Construction/Commissioning	08/14	11/14



FIM ID # 20163 01 Provide Decentralized Boiler WA Governors Mansion

GENERAL

The intent of this measure is to provide a hot water boiler to serve the Governor's Residence independently of the campus central steam plant.

Existing: A central steam plant currently provides the Governor's Residence with heating energy via a steam converter located within the building basement. The central steam boilers operate 24 hours a day to maintain 120 lb steam pressure within the mains, even during periods of little to no campus heating energy demand. This operation leads to significant standby and transmission losses.

Proposed: Provide a condensing boiler dedicated to heating the Governor's Residence, including heating water piping, combustion air and flue ducts, power, controls, and appurtenances.

Benefits: Natural gas savings will be realized by replacing the steam service with a natural gas fired condensing boiler, which has greater combustion efficiency and less transmission losses than the central steam plant.

SCOPE OF WORK INCLUDES

1. Mechanical

- A. Demolish and remove existing steam heat exchanger and appurtenances. Demolish LPS and condensate piping to foundation wall. Cap remaining LPS and condensate piping and abandon in place.
- B. Provide (qty.1) 2000 MBH input condensing boiler, Hydrotherm KN-20 or equal.
- C. Provide factory controller
- D. Replace primary circulation pumps CP-1 & CP-2 (128GPM, 7.5HP)
- E. Replace fin tube circulation pumps CP-3 & CP-4 (75GPM, 5HP)
- F. Replace chemical pot feeder
- G. Replace air eliminator
- H. Replace expansion tank
- Provide new natural gas line to boiler plant. Upgrade existing gas service to accommodate increased load. Load increase is approximately 2200 MBH above existing demand. Reference PSE for owner responsibility. Reconnect gas service to kitchen
- J. Provide pressure regulator and venting to exterior.
- K. Provide outside air and flue vents for the boiler plant
- L. Provide shroud for flue routed up building exterior
- M. Provide draft assist fan, Exhausto or equal.
- N. Provide condensate neutralization unit and condensate disposal to floor drain.
- O. Repipe (4) heating water lines serving existing heating coils in order to make space for flue vents and piping.
- P. Temporarily remove and replace ductwork so boiler can be brought into place.
- Q. Mechanical access via 36" wide concrete stair directly from basement to outdoors.
- R. Modify existing housekeeping pads to suit new equipment.

2. Controls

- A. Integrate boiler and pump controls with existing JCI building management system.
- B. Demolish existing steam and hot water controls no longer used, including tubing, conduit, and controllers.
- C. Provide start/stop control for the boiler.
- D. Provide modulating 3-way mixing valve to control hot water loop temperature. Provide temperature sensor to control mixing valve.
- E. Disconnect and reconnect existing controls for (qty.4) circulation pumps.
- F. Provide hot water supply and return temperature sensors.
- G. Provide controls wiring and conduit; wiring to be mounted to the face of existing basement mechanical room concrete walls.
- H. Provide gas meter for boiler. Tie into BMS.
- I. Provide BMS graphics updates.

3. Electrical

- A. Provide power for boiler plant.
- B. Provide power for draft assist fan.
- C. Provide VFD for CP-1 and CP-2
- D. Provide EPO switch.



- E. Provide power to (qty.4) circulation pumps.
- 4. Structural
 - A. Provide equipment connections.
 - B. Sawcut existing opening in mechanical room wall 12" lower to make space for flue and vent piping.
- 5. Architectural
 - A. Provide shroud up east outside wall to 2nd floor roof to cover vents.
- Civil
 - A. Provide drywell with drain for area at the base of the flue riser.
- 7. Acoustical
 - A. Not applicable.
- 8. Specialty
 - A. Not applicable.
- 9. Commissioning
 - A. Provide FPT and PTP of boiler, flue exhaust fan, and (qty.4) circulation pumps.
 - B. Provide pre-testing on existing (4) circulation pumps.
- 10. Demolition and Removal
 - A. Not applicable.
- 11. Allotments
 - A. Not applicable.
- 12. Design
- A. Provide design as required for this FIM. If applicable, pricing for design is included in Table 4.1.
- 2. Measurement and Verification (M&V)
 - A. Refer to table 3.2. If applicable, pricing for M&V is included in Table 4.1.
- 3. Training
 - A. Provide training as required for this FIM.

- 1. Hazardous material survey and abatement are excluded unless specifically noted in the scope above.
- 2. If existing equipment or components are reused, repairs to existing are not included unless specifically noted in the scope above.
- 3. Boiler and flue fan system are designed for N+0 redundancy.
- 4. Landscaping has been removed from scope. Assumed that B&G landscaping crew will want to be responsible.
- 5. PSE has indicated 105' of 5/8" gas line will need to be replaced with 2" line. There is no cost to owner for this work. However, the existing gas service to the building will be down while the new meter/gas line is installed. The kitchen gas will be down during this period of time.



FIM ID # 20167 05 Interior Storm Windows WA Governors Mansion

GENERAL

The intent of this measure is to provide storm windows installed on the inside face of the existing glazing.

Existing: The existing windows are original to the building. These windows are single pane and have poor thermal and shading performance and air sealing.

Proposed: Provide window inserts to be installed on the inside face of the existing glazing.

Benefits: Energy savings will be realized by reducing solar heat gain, improving the glazing thermal performance, reducing infiltration due to air leakage, and increasing room mean radiant temperature.

SCOPE OF WORK INCLUDES

- 1. Mechanical
 - A. Not applicable.
- 2. Controls
 - A. Reduce occupied heating temperature setpoints by 1 F for all spaces.
- 3. Electrical
 - A. Not applicable.
- Structural
 - A. Not applicable.
- 5. Architectural
 - A. Scope based on Indow Window provided budgetary proposal.
- Acoustical
 - A. Not applicable.
- 7. Specialty
 - A. Not applicable.
- 8. Commissioning
 - A. Not applicable.
- 9. Demolition and Removal
 - A. Not applicable.
- 10. Allotments
 - A. Not applicable.
- 11. Design
 - A. Provide design as required for this FIM. If applicable, pricing for design is included in Table 4.1.
- 2. Measurement and Verification (M&V)
 - A. Refer to table 3.2. If applicable, pricing for M&V is included in Table 4.1.
- 3. Training
 - A. Provide training as required for this FIM.

- 1. Hazardous material survey and abatement are excluded unless specifically noted in the scope above.
- If existing equipment or components are reused, repairs to existing are not included unless specifically noted in the scope above.
- 3. Optional window sleeves have been included in cost.



FIM ID # 20170 08 Provide Demand Controlled Ventilation WA Governors Mansion

GENERAL

The intent of this measure is to provide CO2 based demand controlled ventilation for the chilled water air handling units serving the occupied areas of the Governor's Residence.

Existing: The existing air handling units do not have a means of reducing airflows to match the building occupancy.

Proposed: Provide room sensor based demand controlled ventilation for the chilled water air handling units, including sensors, controls, commissioning, and appurtenances.

Benefits: Heating and cooling energy usage associated with the conditioning of ventilation air will be reduced through reducing ventilation rates to match building occupancy.

SCOPE OF WORK INCLUDES

- 1. Mechanical
 - A. Not applicable.
- 2. Controls
 - A. Provide zone CO2 DCV control of (qty.7) constant volume chilled water air handling units (FC-001, FC-102, FC-103, FC-104, FC-105, FC-201, FC-202, FC-301). Provide (qty.7) CO2 sensors, (qty.7) control wiring, conduit, and appurtenances. Scope assumes existing controllers have sufficient spare points to accommodate added controls.
 - B. Provide push button occupancy control of (qty.1) constant volume chilled water air handling unit (FC-101). Push button to be located in Office (RM 101).
 - C. Provide BMS status monitoring of (qty.1) kitchen range exhaust fan
 - D. Provide programming and graphics updates to JCI Metasys BMS.
- 3. Electrical
 - A. Not applicable.
- 4. Structural
 - A. Not applicable.
- 5. Architectural
 - A. Not applicable.
- 5. Acoustical
- A. Not applicable.
- 7. Specialty
 - A. Not applicable.
- 8. Commissioning
 - A. Provide air balance for (qty.7) air economizers. Provide FPT and PTP of CO2 sensors and DCV controls sequences.
 - B. Provide repair budget for replacement of (qty.4) damper actuators. Note to estimating; the intent of this budget is to address unforeseen issues that arise during the commissioning process.
- 9. Demolition and Removal
 - A. Not applicable.
- 10. Allotments
 - A. Not applicable.
- 11. Design
 - A. Provide design as required for this FIM. If applicable, pricing for design is included in Table 4.1.
- 2. Measurement and Verification (M&V)
 - A. Refer to table 3.2. If applicable, pricing for M&V is included in Table 4.1.
- 3. Training
 - A. Provide training as required for this FIM.

- 1. Hazardous material survey and abatement are excluded unless specifically noted in the scope above.
- 2. If existing equipment or components are reused, repairs to existing are not included unless specifically noted in the scope above.
- TAB to be completed after window inserts and weatherization have been completed. Any work done after TAB will affect results.



FIM ID # 20169 09.01 Interior Lighting Upgrade WA Governors Mansion

GENERAL

The intent of this measure is to replace all incandescent lamps with LED equivalent lamps and upgrade old linear fluorescent fixtures.

Existing: The existing fixtures use traditional incandescent lamps in a variety of fixture types. These lamps consume higher energy, are inefficient at converting energy into light, and have a lower life expectancy than modern lamp technologies. Additionally, there are several fixtures with older technology linear fluorescent lamps which consume more energy than newer types.

Proposed: Replace each incandescent lamp with an LED equivalent and maintain the existing fixture. Lighting controls will remain. The T12 linear fluorescent fixtures shall be retrofitted to T8 lamps and electronic ballasts. Replace T12 undercabinet lighting in the 2nd Floor Kitchen with LED replacements. All existing compact fluorescent 2 and 4-pin connection types will remain.

Benefits: LED lighting provides improved efficacy, efficiency, and operational life compared to traditional incandescent lamp types. New, lower wattage T8 linear fluorescent fixtures will produce improved light quality compared to the existing T12, while saving energy.

SCOPE OF WORK INCLUDES

- 1. Lighting
 - A. Relamp (341) incandescent-type lamps (serving 227 fixtures) with LED equivalents.
 - B. Retrofit (14) T8 and T12 fixtures with 28W T8 lamps and ballasts.
 - C. Replace (1) 4ft. 2-lamp T12 Industrial fixture with T8 2-lamp equivalent.
 - D. Replace (1) 42W screw-in CFL socket mounted fixture with (1) LED Canopy type.
 - E. Replace (5) 1-lamp T12 undercabinet-type fixtures with an LED equivalent.
 - F. Refer to the Lighting Specifications for all means and methods associated with pre-construction, construction, and closeout requirements for a complete Lighting Project.
 - G. Disposal of all old lamps and ballasts per current EPA regulations and provide documentation for project closeout.
- 2. Controls
 - A. Install (7) occupancy sensor wall switches as indicated in the Lighting Audit.
- 3. Commissioning
 - A. Perform a sample testing of the new occupancy sensor controls operation.
- 4 M&V
 - A. Refer to table 3.2.

- 1. Hazardous material abatement is excluded.
- 2. If existing lighting equipment is reused, repairs to existing equipment, or building electrical/wiring are not included unless specifically noted in the scope of work above.
- 3. Work to be performed during standard regular work hours (6:00AM to 5:00PM; Monday Friday)
- 4. Pricing assumes that workspace will be free of major obstacles, includes but limited to vehicles, un-scheduled events, floor finishing/sealing or painting...
- 5. No existing NEC code violations were identified during the Detailed Engineering Study and all existing fixtures are assumed to be installed per code.
- 6. Proposed fixture selections are based on the information obtained during the audit walkthrough, and any follow up conversations between McKinstry and the owner to clarify any unknowns about the existing lighting systems. Any changes made to the baseline audit data may impact the proposed scope of work. If this occurs, McKinstry will work with the Owner to adjust scope and budgets.
- 7. McKinstry assumes that the floor is capable of supporting a standard lift and will include standard floor protection for high bay lifts. Measures to spread load across the floor are not included.



FIM ID # 21015 09.02 Exterior Lighting Upgrades **WA Governors Mansion**

GENERAL

The intent of this measure is to upgrade existing HID lighting with LED equivalent alternatives.

Existing: There are several variations of both high pressure sodium and incandescent fixtures that serve the exterior grounds and driveway. Each area of the campus lighting is controlled by either a timeclock or Metasys controls system depending on the location.

Proposed: Perform a one-for one LED retrofit or replacement of the selected fixture as indicated within the Lighting Spreadsheet. Lighting Controls scheme will remain.

Benefits: LED lighting provides improved efficacy, efficiency, and operational life compared to traditional HID lamp types.

SCOPE OF WORK INCLUDES

- 1. Liahtina
 - A. Retrofit (5) 8ft. T12 2-lamp fluorescent fixtures with 4ft. T8 4-lamps and ballasts.
 - B. Relamp (3) CFL lamp in a Sconce with an LED lamp.
 - C. Replace (12) 150W HPS Flood and Area fixtures with LED equivalents.
 - D. Replace (13) 250W HPS Flood fixtures with LED equivalents.E. Replace (4) 60W PAR lamps with LED equivalents.

 - F. Refer to the Lighting Specifications for all means and methods associated with pre-construction, construction, and closeout requirements for a complete Lighting Project.
 - G. Disposal of all old lamps and ballasts per current EPA regulations and provide documentation for project closeout.
- M&V
 - A. Refer to table 3.2

- 1. Hazardous material abatement is excluded.
- 2. If existing lighting equipment is reused, repairs to existing equipment, or building electrical/wiring are not included unless specifically noted in the scope of work above.
- 3. Work to be performed during standard regular work hours (6:00AM to 5:00PM; Monday Friday)
- 4. Pricing assumes that workspace will be free of major obstacles, includes but limited to vehicles, un-scheduled events, floor finishing/sealing or painting...
- 5. No existing NEC code violations were identified during the Detailed Engineering Study and all existing fixtures are assumed to be installed per code.
- 6. Proposed fixture selections are based on the information obtained during the audit walkthrough, and any follow up conversations between McKinstry and the owner to clarify any unknowns about the existing lighting systems. Any changes made to the baseline audit data may impact the proposed scope of work. If this occurs, McKinstry will work with the Owner to adjust scope and budgets.
- 7. McKinstry assumes that the floor is capable of supporting a standard lift and will include standard floor protection for high bay lifts. Measures to spread load across the floor are not included.



FIM ID # 20175 13 Provide Domestic Hot Water Heater WA Governors Mansion

GENERAL

The intent of this measure is to replace the existing domestic water heater with a condensing domestic water heater.

Existing: Domestic water heating is provided by a domestic water storage tank with integral steam heat exchanger.

Proposed: Provide a condensing instantaneous domestic water heater to replace the steam water heater, including, piping, expansion tank, controls, and appurtenances.

Benefits: Domestic water heating energy usage will be reduced through improving the combustion efficiency and reducing standby losses of the domestic water heaters.

SCOPE OF WORK INCLUDES

- 1. Mechanical
 - A. Demolish and remove existing 125 gallon steam water heater. Include demolish to the wall/ceiling and capping of the steam lines serving the water heater.
 - B. Demolish existing domestic hot water circulation pump.
 - C. Provide (1) condensing instantaneous water heater, including expansion tank, factory controls, piping connection to existing domestic hot water system, pressure relief valve, integral circulation pump, condensate neutralization unit and disposal to floor drain, isolation valves, and appurtenances. Navien model NPE-240A.or equal. Mount water heater on unistrut base. Reference sketches for FIM 20163 for flue and intake duct routing.
 - D. Provide domestic hot water circulation pump.
 - E. Provide 50' 34" piping from existing recirculation line to instantaneous water heater recirculation inlet.
 - F. Provide outside air and flue ducts to building exterior, vent material shall be 3" schedule 40 pvc, approximate flue combustion air and flue duct length of 75' each.
 - G. Provide shroud for length of flue routed up side of building
 - H. Provide 1/3 2/3 thermostatic mixing valve assembly, install within basement mechanical room.
 - I. Mechanical access via 36" wide concrete stair directly from basement to outdoors.
- 2. Controls
 - A. Provide gas meter. Connect to BMS. Provide graphical changes as applicable.
 - B. Provide controls for domestic hot water circulation pump. Provide graphical changes as applicable.
- 3. Electrical
 - A. Provide (qty.1) 120V 2A power supply to water heater.
- 4. Structural
 - A. Provide equipment connections.
- 5. Architectural
 - A. Not applicable.
- 6. Acoustical
 - A. Not applicable.
- 7. Specialty
 - A. Not applicable.
- 8. Commissioning
 - A. Provide function performance testing.
- 9. Demolition and Removal
 - A. Not applicable.
- 10. Allotments
 - A. Provide FPT of water heater.
- 11 Design
 - A. Provide design as required for this FIM. If applicable, pricing for design is included in Table 4.1.
- 2. Measurement and Verification (M&V)
 - A. Refer to table 3.2. If applicable, pricing for M&V is included in Table 4.1.
- 3. Training
 - A. Provide training as required for this FIM.



- 1. Hazardous material survey and abatement are excluded unless specifically noted in the scope above.
- 2. If existing equipment or components are reused, repairs to existing are not included unless specifically noted in the scope above.
- 3. Scoping for this FIM assumes it is performed in conjunction with FIM 20163
- 4. Domestic hot water will be out of service for several of days during construction.
- 5. Controls programming of domestic hot water recirculation pump will turn off pump during unoccupied periods. The hot water will not be instantaneous during unoccupied periods.



FIM ID # 21581 15 Recommissioning WA Governors Mansion

GENERAL

This measure addresses the recommissioning of the existing HVAC systems and controls, the air handling units, baseboard convectors, exhaust fans, chilled water system, and control valves.

Existing Condition: The Residence is served by multiple constant volume chilled water air handling units, hydronic baseboard convectors, and other equipment. This equipment was observed to have multiple operations issues, including operating 24 hours a day regardless of building occupancy as well as a lack of nighttime temperature setback.

Proposed Condition: Provide retrocommissioning of the facility HVAC systems, including air handlers and baseboard convectors. Provide updated controls sequences for the Residence and Powerhouse chilled water plant such that after hours calls for cooling utilize the airside economizer as the first stage of cooling, the thermal mass of the chilled water loop as the second stage, and the water cooled chillers as the third stage.

Benefits: Energy savings will be realized through the rebalancing of the air handling unit air economizers, adjusting equipment run hours to match building occupancy, and implementing nighttime temperature setback.

SCOPE OF WORK INCLUDES

- 1. Mechanical
 - A. Not applicable.
- 2. Controls
 - A. Restore unoccupied scheduling and temperature setbacks for all zones; scheduling already implemented in BMS but overridden.
 - B. Provide revised controls sequences for the Residence chilled water system and Powerhouse Chilled Water Plant such that after hours the airside economizers act as the first stage of cooling, the chilled water pumps and thermal mass of the chilled water system act as the second stage of cooling, and the Powerhouse chillers act as the third stage of cooling.
- 3. Electrical
 - A. Not applicable.
- 4. Structural
 - A. Not applicable.
- 5. Architectural
 - A. Not applicable.
- 6. Acoustical
 - A. Not applicable.
- 7. Specialty
 - A. Not applicable.
- 8. Commissioning
 - A. Provide FPT and PTP of the air handlers, baseboard convectors, reheat coils, and circulation pumps.
- 9. Demolition and Removal
 - A. Not applicable.
- 10. Allotments
 - A. Not applicable.
- 11. Design
 - A. Provide design as required for this FIM. If applicable, pricing for design is included in Table 4.1.
- 2. Measurement and Verification (M&V)
 - A. Refer to table 3.2. If applicable, pricing for M&V is included in Table 4.1.
- 3. Training
 - A. Provide training as required for this FIM.

- 1. Hazardous material survey and abatement are excluded unless specifically noted in the scope above.
- 2. If existing equipment or components are reused, repairs to existing are not included unless specifically noted in the scope above. No allowance included in budget to repair existing equipment.
- 3. Refer to Table 3.2 for proposed scheduling and setpoint adjustments.



FIM ID # 23298 16 Commercial Dishwashers WA Governors Mansion

GENERAL

This measure includes replacing the existing low temperature commercial dishwashers with new units that incorporate internal booster heaters. The low temperature units utilize chemical sterilizers which cannot be used with sterling silver flatware. Additionally, the low temperature units require hand drying glassware to avoid water spotting.

SCOPE OF WORK INCLUDES

- Mechanical
 - A. Install two (2) high temperature commercial water heaters. Basis of Design: Hobart LXeR
- 2. Controls
 - A. Not applicable.
- 3. Electrical
 - A. Provide new electrical service to Panel MDB in mechanical room basement.
- 4. Structural
 - A. Not applicable.
- 5. Architectural
 - A. Not applicable.
- Acoustical
- A. Not applicable.
- '. Specialty
 - A. Not applicable.
- 8. Commissioning
 - A. Not applicable.
- Demolition and Removal
 Remove two (2) Hobart LXeC commercial dishwashers.
 - B. Remove existing AO Smith commercial electric booster heater (CMC-6)
- 10. Allotments
 - A. Not applicable.
- 11. Design
 - A. Provide design as required for this FIM.
 - B. Pricing for design is included in Table 4.1.
- 12. Measurement and Verification (M&V)
 - A. Refer to table 3.2.
 - B. Pricing for M&V is included in Table 4.1.
- 13. Training
 - A. Provide training as required for this FIM.

- 1. For the safety of our people and avoidance of potential long-term liability, McKinstry no longer executes subcontracts for abatement of asbestos and lead paint. Any exceptions to this policy must be approved by our CEO or President and our General Counsel. Abatement of asbestos and lead paint shall be the responsibility of the building owner who should contract directly with qualified abatement specialists.
- 2. If existing equipment or components are reused, repairs to existing are not included unless specifically noted in the scope above.



3.1 Guarantee Overview

- 1. <u>Philosophy:</u> McKinstry is prepared to guarantee any portion of a project over which it has direct control. Where McKinstry does not have direct control (such as burn hours associated with lighting), we are prepared to work with the customer to devise a method of Measurement and Verification (M&V), which will provide the highest degree of assurance that the energy cost savings exist.
- 2. <u>This Project:</u> For this project, McKinstry is prepared to guarantee the performance of the installed initiatives to reduce energy consumption. The target energy reductions for the initiatives that will be implemented are as follows: Refer to Section 3, Table 3.1. Based upon the stipulated conditions as enumerated by WA DES personnel and the utility rates as described below, the utility cost savings are also shown in Table 3.1.
- 3. On-going Services: The cost of year 1-3 of Measurement and Verification (M&V) is included in the project scope. The cost of On-going M&V in years 4-10 is at the discretion of WA DES and the DES Project Manager. McKinstry is prepared to continue the guarantee as long as WA DES continues the on-going services as described herein. When WA DES and the DES Project Manager choose to cancel the on-going services, the guarantee will also be terminated at the same point in time. Please refer to Section 3, Table 3.2 for a summary of the proposed measurement and verification scope for years one-three.

3.2 FIM Specific Performance Assurance Methodology

- 1. <u>Guarantees:</u> Table 3.1 Energy Savings Guarantee Summary provides the specific energy consumption savings for each facility improvement measure and the guarantee that McKinstry will provide associated with that measure. Savings calculations are based upon both baseline operating characteristics and proposed operation criteria:
 - a. <u>Baseline:</u> "Baseline" refers to the existing operating characteristics that were used to calculate energy cost savings. The baseline operating characteristics, including system performance and operational expenditures, which were used for this project are provided in Table 3.1. In general, all parties acknowledge the baseline associated with any specific measure has been derived from the following sources:
 - (1) Actual operating information gathered through field observation, measurement, micro-data loggers, and Owner's operating logbooks.
 - (2) Owner provided information concerning stipulated factors such as burn hours, occupancy, or operational expenditures.
 - (3) In some instances, a modified baseline may have been developed to address areas whereby preretrofit conditions do not reflect a system that is operating per current code or what the client may deem as normal operation.
 - b. Proposed: The proposed operating criteria, including system performance and operational expenditures, which were used for savings calculations are provided in Table 3.1. Systems must be operated per the proposed criteria to ensure energy cost savings are realized. McKinstry will provide the initial start-up, commissioning, and programming of the system to ensure that the systems operate per the proposed operating criteria. WA DES acknowledges their responsibility to ensure these criteria are maintained and associated energy savings are realized. Energy Savings Guarantees are predicated based on WA DES maintaining their responsibilities as provided below in "On-Going Owner Responsibilities" In Section 3.5.



 Measurement and Verification Proposal: Refer to separate M&V agreement for details on the proposed M&V scope for years 4-10.

3.3 Utility Rates

- 1. <u>Utility Rate:</u> For the purpose of calculating savings, the utility rates used will be the utility rates as paid by WA DES to the utility company during the pertinent period, adjusted for any rate schedule changes made by the utility company, except that the utility rate used for calculation will never go below or above the Floor Rate. In the event that a building has multiple meters on different rate schedules, the per-unit cost of the utility will be the average of all the rate schedules in effect at that facility.
 - a. Base Utility Rate: Refer to table 3.3 for the Base Utility Rates (including sales tax).
- 2. <u>Floor Utility Rate:</u> For the purpose of calculation of savings, this utility rate shall be used throughout the life of this contract to calculate the energy costs savings to WA DES.

3.4 Standards Of Comfort Service

The following section provides the standards of comfort, which WA DES must maintain to ensure the comfort of the occupants and staff, and upon which all energy calculations were based.

HVAC Comfort

Heating, ventilating, and air conditioning (HVAC) systems provided by McKinstry will provide comfort and indoor air quality in accordance with the Standards of Comfort below. This standard will pertain only to buildings and areas of buildings in which McKinstry is installing HVAC equipment that has direct control over space comfort conditions. HVAC comfort conditions cannot be guaranteed when operable windows or doors are open.

Indoor Conditions

Occupied:

Winter Heating Minimum Set-point - 70 degrees F (Superseded by DOH Regs)

Winter Heating Maximum Set-point - 74 degrees F (Superseded by DOH Regs)

Summer Cooling Minimum Set-point – 72 degrees F (where mechanical cooling systems are employed)

Summer Cooling Maximum Set-point - 78 degrees F (where mechanical cooling systems are employed)

Unoccupied:

Minimum - 55 degrees F

Maximum - 85 degrees F (where mechanical cooling systems are employed)

Relative Humidity (If humidity control provided):

Minimum - 40%

Maximum - 60%



Indoor Air Quality

Minimum outside air per occupant:

Minimum outside air per occupant shall be in accordance with American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) standards and *Washington State Ventilation and Indoor Air Quality Code*.

Less stringent conditions will not be proposed unless specifically approved by the client agency (if applicable).

Lighting

Illumination Levels Verification:

Illumination levels shall be as recommended by the Illuminating Engineer's Society of North America (IESNA). For pool facilities, illumination will meet WAC 246-260-031, Table 031.5 lighting requirements (for Washington state pool facilities only).

For primary and secondary schools, illumination will also meet 1997 WAC 246-366-120 lighting requirements (for Washington state school districts only).

Illumination Levels Design:

The lighting and illumination levels for lighting systems provided by McKinstry will meet or exceed current recommended practices by the Illuminating Engineering Society of North America for illumination levels for the various tasks that are conducted throughout WA DES.

3.5 On-Going Owner Responsibilities

WA DES shall provide the following services as part of this energy services project. In the event that these services are not provided, energy savings and associated guarantees will be modified to reflect the associated impact.

- 1. Maintain all equipment per manufacturer's recommendations and proposed maintenance schedule.
- 2. Maintain all sequence of operations and performance criteria related to installed systems as proposed and designed.
- 3. Provide other FIM specific on-going responsibilities as provided in Table 3.2 "Performance Assurance Plan Outline."
- 4. Provide McKinstry with copies of actual monthly utility billing information on a quarterly basis for the duration of the on-going service period. This includes electric, natural gas, and fuel oil. For this project, the on-going service period shall be three years. The associated facilities where utility information shall be provided include all meters providing direct or indirect service to all buildings included in this project.
- 5. Provide McKinstry all internal sub-meter data, including electric and condensate meters, providing direct or indirect service to all buildings included in this project.
- 6. Provide McKinstry access to Energy Management and Control Systems for the purpose of collecting and logging data over time as required for performance verification.
- 7. WA DES shall notify McKinstry in writing concerning any changes or alterations to the building that will affect energy usage. This notification should be provided within two weeks of the change. This includes occupancy or use changes, computer load or other load changes, scheduling changes, and sequence of operations changes.



3.6 Non-Performance

In the event the equipment performance is not met, McKinstry accepts responsibility for additional electricity and natural gas used by the equipment, due to reduced performance. McKinstry may, at its option, execute any of the following options:

- 1. Repair or replace equipment as necessary to meet required performance.
- 2. Make payments for the extra energy consumption to WA DES. In the event that McKinstry chooses the payment option, McKinstry reserves the right to select either an annual payment for the duration of the guarantee term or a one-time lump-sum payment of the same amount. In either case, the payment will be calculated based upon the quantity of additional electricity or natural gas used and the Base Utility Rate as described above.

3.7 Change Of Use

In the event that WA DES chooses to make changes to the facility that require set point adjustments, longer operating hours, or continuous equipment operation, WA DES agrees that:

- 1. Savings deemed as met described above will continue to be deemed as met.
- 2. Additional cost of extended equipment operation is a cost of the change, not due to a failure of McKinstry or their equipment.
- 3. McKinstry shall not be responsible for any increase in energy, maintenance, or any other costs incurred because of the extended equipment operation.
- 4. During the M&V portion of the project McKinstry at its option may make a baseline energy use adjustment to identify and account for a change-of-use at the facility.
- 5. McKinstry will calculate the change in energy consumption due to the specific change made to the system's operation.





Table 3.1 - Energy Savings Summary

Project WA Governor's Mansion 2013

Scenario FINAL Date 3/7/2014

					Electricity			Natural Gas Water		Sewer		Other	Total **			
Facility Improvement Measures	Facility	Guarantee Multiplier for Positive Numbers *		Net Effective Guarantee Multiplier *	kW	kW (\$)	kWh	kWh (\$)	Therm	Therm (\$)	CCF	CCF (\$)	CCF	CCF (\$)	(\$)	(\$)
01 Provide Decentralized Boiler	WA Governor's Mansion	90.0%	110.0%	90.0%	0.0	\$0	0	\$0	7,036	\$4,009	0	\$0	0	\$0	\$0	\$4,009
05 Interior Storm Windows	WA Governor's Mansion	90.0%	110.0%	90.0%	0.0	\$0	206	\$12	2,108	\$1,201	0	\$0	0	\$0	\$0	\$1,213
08 Provide Demand Controlled Ventilation	WA Governor's Mansion	90.0%	110.0%	90.0%	17.1	\$63	503	\$29	6,844	\$3,900	0	\$0	0	\$0	\$0	\$3,992
09.01 Interior Lighting Upgrade	WA Governor's Mansion	90.0%	110.0%	89.6%	102.6	\$380	17,516	\$1,007	-59	-\$34	0	\$0	0	\$0	\$0	\$1,352
09.02 Exterior Lighting Upgrades	WA Governor's Mansion	90.0%	110.0%	89.5%	36.9	\$137	11,158	\$641	-39	-\$22	0	\$0	0	\$0	\$0	\$756
13 Provide Domestic Hot Water Heater	WA Governor's Mansion	90.0%	110.0%	90.0%	0.0	\$0	0	\$0	208	\$118	0	\$0	0	\$0	\$0	\$118
15 Recommissioning	WA Governor's Mansion	90.0%	110.0%	90.0%	0.0	\$0	12,206	\$701	528	\$301	0	\$0	0	\$0	\$0	\$1,002
16 Commercial Dishwashers	WA Governor's Mansion	90.0%	110.0%	90.0%	0.0	\$0	0	\$0	0	\$0	0	\$0	0	\$0	\$0	\$0
-		•		Totals ***	156.6	\$579	41,589	\$2,390	16,626	\$9,474	0	\$0	0	\$0	\$0	\$12,443

^{*} The savings shown in this table are less than the calculated savings unless a guarantee multiplier of 100% is shown.

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^{**} The guarantee is based on Key Performance Indicators shown in Table 3.2. Refer to Section 3 of the ESP for the method of converting Key Performance Indicators to dollars during the M&V period.

^{***} The guarantee is based on the aggregate savings for all FIMs, not on individual FIM savings.



Table 3.2 - M&V Plan Outline

Project WA Governor's Mansion 2013
Scenario FINAL
Date 3/7/2014

							Audit Stage (Baselining)	Post Retrofit (Commissioning)				
FIM Name	Facility	IPMVP Option	KPI	Key Performance Indicators	Baseline Values	Proposed Values	Tasks	Tasks	Remote Alarming and/or Monitoring	Recommended M&V Tasks	Ongoing Owner Responsibilities	Stipulated Factors
01 Provide Decentralized Boiler	WA State Governor's Residence	А	1.	Hours of operation	8,760	8,760	Trend building steam flow, pressure and temperature	Verify air handling unit occupancy schedule as implemented in building management system (BMS)	None proposed.	Verify residence occupancy schedule.	Maintain equipment per manufacturer recommendations	Internal loads and weather conditions, occupancy schedules, setpoints.
	WA State Governor's Residence		2.	Steam system efficiency	62.1% based on an analysis of power house steam system standby losses	N/A	Campus steam system efficiency	Verify steam no longer utilized as a heating source for building space heat	None proposed.	Verify residence occupancy schedule.	Maintain equipment per manufacturer recommendations	Internal loads and weather conditions, occupancy schedules, setpoints.
	WA State Governor's Residence		3.	Boiler combustion efficiency	N/A	88% @ 140 F RWT	Not present	Provide combustion efficiency test, provide startup, functional performance test (FPT) documents and point-to-point (PTP) documents for boiler.	None proposed.	Perform combustion efficiency test, BMS trend heating water supply temperature, return temperature, supply/return water temperature setpoints, and outside air temperature for 2 week interval to verify temperature control and reset.	Maintain equipment per manufacturer recommendations	Internal loads and weather conditions, occupancy schedules, setpoints.
05 Interior Storm Windows	WA State Governor's Residence	А	1.	Perimeter zone heating temperature setpoint	72 F	71 F	Verify perimeter zone heating temperature setpoints	Verify perimeter zone heating temperature setpoints	None proposed.	Verify perimeter zone heating temperature setpoints	Maintain equipment per manufacturer recommendations	Internal loads and weather conditions, occupancy schedules, setpoints.
	WA State Governor's Residence		2.	Glazing system center of glass U-value	1.1	0.6	Verify existing glazing type and area and estimate existing glazing performance.	Verify the installation of window inserts on fixed glazing per project requirements, verify center of glazing u- value using manufacturer provided submittals	None proposed.	Verify window inserts are in-place in heating season	Maintain equipment per manufacturer recommendations	Internal loads and weather conditions, occupancy schedules, setpoints.
08 Provide Demand Controlled Ventilation	WA State Governor's Residence	А	1.	Minimum outside air percentage	34.2%, average of all AHUs	15% minimum (excluding FC-101), varies damper position to maintain supply air CO2 setpoint	Log one OAT and (3) AHU MAT's & RAT's to compute OAT %	Provide FPT and PTP documents for air handling units. Verify minimum airflows as specified in design documents and controls sequences meet project requirements.	Alarm on override of DCV control.	BMS trend outside air temperature, return air temperature, discharge air temperature, discharge air temperature, economizer status, and zone occupancy status or return air CO2 concentration and concentration setpoint for sample of air handling units for 2 week interval to verify outside air percentage and proper modulation of economizer dampers to control to zone occupancy or return air CO2 setpoint.	Maintain equipment per manufacturer recommendations	Internal loads and weather conditions, occupancy schedules, setpoints.
	WA State Governor's Residence		2.	FC-101 status control	Scheduling	Scheduling and occupancy sensor or push button override	Log one OAT and (3) AHU MAT's & RAT's to compute OAT %	Provide FPT and PTP documents for air handling units. Verify minimum airflows as specified in design documents and controls sequences meet project requirements.	Alarm on override of AHU status.	BMS trend FC-101 unit status, room temperature setpoint, and pushbutton override status for 2 week period to verify proper operation of fancoil unit.	Maintain equipment per manufacturer recommendations	Internal loads and weather conditions, occupancy schedules, setpoints.
09.01 Interior Lighting Upgrade	WA State Governor's Residence	А	1.	Light levels	See detailed lighting audit	See detailed lighting audit	Light level survey in sample of spaces	Light level survey in sample of spaces	None proposed.	None proposed.	Maintain equipment per manufacturer recommendations	Annual operating hours, occupancy levels, and schedules (based on facility staff interview)



Table 3.2 - M&V Plan Outline

Project WA Governor's Mansion 2013
Scenario FINAL
Date 3/7/2014

Date	3/7/2014						Audit Stage (Baselining)	Post Retrofit (Commissioning)				
FIM Name	Facility	IPMVP Option	KPI	Key Performance Indicators	Baseline Values	Proposed Values	Tasks	Tasks	Remote Alarming and/or Monitoring	Recommended M&V Tasks	Ongoing Owner Responsibilities	Stipulated Factors
			2.	Fixture input power (watts)	See detailed lighting audit	See detailed lighting audit	Site review	Stipulated ANSI values	None proposed.	None proposed.	Maintain equipment per manufacturer recommendations	Annual operating hours, occupancy levels, fixture burn hours, and schedules (based on facility staff interview)
09.02 Exterior Lighting Upgrades	WA State Governor's Residence	А	1.	Fixture input power (watts)	See detailed lighting audit	See detailed lighting audit	Site review	Stipulated ANSI values	None proposed.	None proposed.	Maintain equipment per manufacturer recommendations	Annual operating hours, occupancy levels, fixture burn hours, and schedules (based on facility staff interview)
13 Provide Domestic Hot Water Heater	WA Governors Mansion	А	1.	Domestic hot water heating system energy factor	55%	97%	Verify nameplate efficiency	Verify that the water heater efficiency as specified in approved submittal documents meet project requirements.	None proposed.	None proposed.	Maintain equipment per manufacturer recommendations	Internal loads and weather conditions, occupancy schedules, setpoints.
15 Recommissioning	WA Governors Mansion	А	1.	Occupancy Schedule	Scheduled occupied 24/7	Scheduled occupied 5 am to 10 pm daily	Log (3) AHU motor status to determine occupancy schedule and run hours	Provide FPT and PTP documents for air handling units. Verify occupancy schedule programmed into BMS.	Alarm on override of occupancy schedule.	BMS trend supply fan status for a sample of air handling units for a 2 week interval to verify occupancy schedule and air handler run hours.	Maintain equipment per manufacturer recommendations	Internal loads and weather conditions, occupancy schedules, setpoints.
	WA State Governor's Residence		2.	Unoccupied Temperature Setpoint	74 F cooling temperature setpoint, 71 F heating temperature setpoint	74 F cooling temperature setpoint, 66 F heating temperature setpoint	Log (3) AHU return air temperatures to determine occupied and unoccupied temperature setpoints	Provide FPT and PTP documents for air handling units. Verify temperature setpoints programmed into BMS.	Alarm on override of unoccupied temperature setpoint.	BMS trend space temperatures for a sample of zones for a 2 week interval to verify unnoccupied temperature setback.	Maintain equipment per manufacturer recommendations	Internal loads and weather conditions, occupancy schedules, setpoints.

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Table 3.3 - Base Utility Rates

Project WA Governor's Mansion 2013

Scenario FINAL Date 3/7/2014

Building_Name	Utility_Provider	Rate_Name	Utility_Type	Dollars_Per_Unit	Units	Published_Date_Effective
WA Governors Mansion	Puget Sound Energy (PSE)	49	Electricity	\$0.057465	kWh	10/1/2013
WA Governors Mansion	Puget Sound Energy (PSE)	49D	Electricity Demand	\$3.700000	kW	10/1/2013
WA Governors Mansion	Puget Sound Energy (PSE)	85	Natural Gas	\$0.569810	Therms	10/1/2013

4.1 Maximum Project Allowable Cost

McKinstry guarantees that the Maximum Project Cost will not exceed \$683,002. This cost does not include sales tax, WA State Interagency fees, or the Utility rebate, which is determined by the customer's utility company. With sales tax and interagency fees included, the estimated Project Cost will be \$785,152. (McKinstry does not guarantee the value of sales tax, interagency fees, or the utility incentive.)

Costs presented in this proposal are valid for 30 days from the date of publication. If the notice to proceed is issued after the 30 days from publication, McKinstry reserves the right to re-evaluate the project and make necessary modifications to the construction costs.

4.2 Project Cost Table

(See Table 4.1 - "Budget Summary Breakdown" - ALL FEE PERCENTAGES and costs are unique to the project)

4.3 Items Included In Maximum Project Cost

- 1. Engineering audit, which includes the cost for the preparation of this proposal
- 2. Engineering design
- 3. Construction management services
- 4. Installation of McKinstry Equipment including the following costs as specified in the scope of work:
 - A. All costs paid by McKinstry for the installation of the equipment. This includes costs paid to subcontractors or directly to McKinstry personnel, when related to installation or system verification of McKinstry equipment.
 - B. The portion of reasonable travel, lodging, and meal expenses of officers or employees incurred while traveling in discharge of duties connected with the work. McKinstry will comply with OFM guidelines for reimbursement of travel expenses.
 - C. Cost of all equipment, materials, supplies, and equipment incorporated in the Work, including costs of transportation thereof.
 - D. Cost or rental charges, including transportation and maintenance, of all materials, supplies, equipment, temporary facilities, and hand tools not owned by the workers, which are consumed in the performance of the work and cost less salvage value on such items used but not consumed which remain the property of McKinstry.
 - E. Cost of premiums for all bonds and insurance, which McKinstry is required to purchase and maintain.
 - F. Sales, use, or similar taxes related to the Work and for which McKinstry is liable imposed by a governmental authority.
 - G. Permit fees, royalties, and deposits lost for causes other than McKinstry's negligence.
 - H. Losses and expenses not compensated by insurance or otherwise, sustained by McKinstry in connection with the work, provided they have resulted from causes other than the fault or neglect of McKinstry. Such losses shall include settlements made with the written consent and approval of the Owner and the DES Energy Program. If, however, such loss requires reconstruction and McKinstry is placed in charge thereof, McKinstry shall be paid a fee for such services.
 - I. Demolition cost and cost of removal of all debris unless specifically excluded within the Scope of Work.
 - J. Costs incurred due to an emergency affecting the safety of persons and property.
 - K. Other costs incurred in the performance of the Work if and to the extent approved in advance in writing by the Owner.
 - L. Contingency as defined in Section 4.4.



- M. Allowances as defined in Section 4.5.
- N. Cost of equipment startup, training, system verification, and balancing performed by McKinstry.
- O. Construction Bonds (including Performance & Payment Bond), Liability Insurance, and Builder's Risk Insurance.
- P. McKinstry fee. This includes McKinstry's remuneration for compensation of personnel, expenses, risks related to the project, overhead, and profit.
- Q. McKinstry shall provide a Schedule of Values. The schedule of values will include all costs related to the installation of McKinstry's equipment. See TABLE 4.5 "Construction Schedule of Values/Projected Progress Billings."

4.4 Construction Contingency

A construction contingency as identified in table 4.1 – "Budget Summary Breakout" has been established for this project. McKinstry can expend the contingency after a change order has been approved by the Owner, the ESCO and the DES Project Manager for items necessary to complete the original scope of this project. The intent of the contingency is for "unforeseen conditions" beyond what was originally estimated. McKinstry shall not be allowed to mark-up contingency funds expended for items required in the original Scope of this project. McKinstry and the Owner will jointly manage any contingency left after the project scope is completed. McKinstry shall be allowed to mark-up items beyond the original scope and approved by Owner. All unused construction contingency funds shall reduce the overall project cost to the Owner.

4.5 Allowances

McKinstry may set aside allowances as identified in Table 4.1 - "Budget Summary Breakdown" for specific areas of work that have been identified as a potential cost impact but cannot be determined at this stage. Should the allowance not be adequate, the Owner and the DES Project Manager will be advised, and McKinstry will be compensated for any additional costs via Change Order to the contract. When actual costs for scope identified as Allowance are less than the Allowance amount, the difference will be allocated to Contingency. In extreme situations, McKinstry may request additional funds to cover cost overruns that could not have been foreseen by either party.

4.6 On-Going Services

Measurement and verification is included for three years for this project.

No On-going Services in years four-ten have been proposed for this phase of the project.

4.7 Accounting Records

McKinstry shall check all material, equipment, and labor entering into the worksite and shall keep such full and detailed accounts as may be necessary for proper financial management under this Agreement. The Owner and the DES Project Manager shall be afforded access to all the ESCO's records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to this Contract, and the Contract shall preserve all such records for a period of seven years, or for such longer period as may be required by law, after the final payment.

4.8 Reconciliation of Labor & Material Costs

The maximum project allowable cost is based on firm negotiated bids or estimated labor and material costs developed by the ESCO. In recognition that actual Labor & Material costs may vary from the estimate, the following procedures are established to reconcile this difference:



- 1. If the total maximum guaranteed project cost at completion exceeds the estimated amount (plus contingency), the additional costs will be borne by McKinstry at their expense.
- 2. If the total project costs at completion are less than the estimated proposal amount (less contingency), the savings will be retained by the Owner.
- 3. There shall be no cost savings split between the Owner and McKinstry.

The following Figure 4.A outlines proposed procurement and payment reconciliation methods. Changing the proposed method of reconciliation after the acceptance of the Proposal may require an adjustment to the Guaranteed Maximum Project Cost.

DEFINITIONS:

<u>Major Equipment</u>: Major Equipment is any single piece of equipment purchased by McKinstry with a value over \$5,000.

<u>Negotiated</u>: Construction contract value is to be established through negotiations with a select or single contractor (i.e. owner preferred controls contractor, mechanical contractor, etc.).

<u>Bid</u>: Construction contract value is to be established through a bid process based upon formal bid documents including plans and specifications which will be bid to a minimum of two (typically three) pre-qualified contractors as approved by the ESCO and owner. Owner shall endorse any selection of a Subcontractor or equipment that is other than low bid through a properly executed change order.

<u>Self-Perform</u>: McKinstry intends to perform work with McKinstry and/or McKinstry personnel.

<u>Schedule of Values (SOV)</u>: - Cost shall be substantiated with a properly executed invoice from the subcontractor or supplier that matches the schedule of values in their contract or purchase order.

<u>Time & Materials (T&M)</u>: Published sell rates will be established prior to issuance of contract to subcontractor or commencement of work by McKinstry. A monthly labor and material report will be provided which will include labor hours and dollars per individual, and material and equipment invoices.

Firm: Fees that are negotiated prior to proposal and are not reconciled at the end of the project.

Figure 4.A

Construction Cost Category (ref Table 4.1)	Proposed Construction Method	End of Project – Reconciled (SOV or T&M)		
Controls Systems	Negotiated Subcontract Sole Source	SOV		
Major Equipment	Negotiated	SOV		
Sheet Metal	Subcontract Bid	SOV		
Electrical	Subcontract Bid	SOV		
Lighting	Subcontract Bid	SOV		
General Construction	Self-Perform	T&M		
TAB/Start up	Self-Perform	T&M		
Commissioning	Self-Perform	T&M		
Change Order (CO)	As Specified in CO	T&M		
ESCO Fees	Self-Perform	Firm		



4.9 ESCO Compensation

- 1. TERMS: Net 30 days (45 days for State Treasurer payments) from the date of invoice, monthly billings as the job progresses.
- 2. PAYMENTS: At a minimum, payments will be made in the amount of 100% at the completion and implementation of any individual facility improvement measure (FIM) in the amount of that FIM as delineated in the contract. If more than one FIM is completed in a monthly period, all those FIMS will be paid.
- 3. FINANCE CHARGES ON UNPAID BALANCES: Payments due and unpaid shall be subject to interest charges within 30 days (45 days for State Treasure payments) of receipt of a properly completed invoice per RCW 39.76. Finance charges will be calculated on the un-billed balance at the rate of Prime + 2% per annum. Charges accrue until balances are paid in full. Interest charges will be calculated daily, compounded monthly.
- 4. CONSTRUCTION PERIOD FINANCE: McKinstry may charge construction period finance for projects, independent of financing method, whereby the anticipated billing lags the earned schedule of values by more than 90 days. Table 4.5 provides the anticipated maximum construction period finance charges for this project based on the estimated earned value each month verses the anticipated billing collection schedule. If Owner controlled schedule delays occur during the progress of the project, the Contractor may request additional finance charges be added to the project. Construction period finance will be calculated on the un-billed balance at the rate of Prime + 2% per annum. Interest charges will be calculated daily, compounded monthly. Charges accrue until balances are paid in full.

McKinstry and the Owner will work together to minimize finance charges. Table 4.5 has been created based on the following criteria:

- WA DES accepts invoices in accordance with State Treasury loan cycle
- WA DES requires 5 working days to substantiate McKinstry invoice
- Owner requires 10 working days to process invoice
- · McKinstry will submit invoices 15 working days prior to State Treasurer cutoff date

Table 4.5 has been created in conjunction with the construction schedule located in Section 2. The construction schedule has been developed based on the following assumptions:

- Owner review of final Energy Services Proposal (ESP) 10 working days
- McKinstry receives notice to precede within 15 working days from the final review responses
- 5. SUBSTANTIATION OF FINANCE CHARGE: McKinstry will do an accounting of finance charges progressively through the project, and at contract completion submit a change request itemizing the summary of additional costs for implementation. The contract will then be increased to reflect the same and finance charges will be paid within 30 days of the date of approved substantiation. Maximum Project Cost will be adjusted to reflect the additional finance charges and billings will be adjusted accordingly.

4.10 Financing

McKinstry enjoys over fifty-years of experience within the engineering and contracting industry and its financial strength exceeds the industry average. This strength makes it possible to provide and assist with the financing needs of its customers. Long standing relationships with vendors assures reasonable pricing and excellent payment terms.

<u>LONG-TERM FINANCING:</u> The Owner has several options available for long term permanent financing. The State Treasurer Certificate of Participation (COP) program can provide financing terms up to a 12-year payment plan. Third Party financing is also available. Current finance rate on long-term, permanent financing is currently in the range of 3.0% – 4.0%, but will vary until a rate has been locked in.



The Financial scenarios assume a 10 year loan through the State COP program which is currently 3.25%. In order to be conservative a rate of 3.5% has been used as the annual loan interest rate (Table 4.3 – Cash Flow Analysis)

1. Base option financial Scenario through State of Washington Treasurers Office:

Figure 4.B

Total Project Cost	\$785,152
Owner Capital Infusion	\$785,152
Utility Rebate	\$31,138
Financed Amount	\$0
Term of Loan	N/A
Interest Rate	N/A
Number of Payments per Year	N/A
Annual Payment	\$N/A
Simple Payback	56.8 Years

Table 4.3 located in the end of this section provides a Cash Flow Analysis for this project over the 20 years.

4.11 Termination Value

Refer to program guidelines for information on Termination values.

4.12 Terms of Agreement

The Contract shall be effective and binding upon the parties immediately upon its execution and the period from contract execution until the Commencement Date shall be known as the "Interim Period". All energy savings achieved during the interim period will be fully credited to Owner, and may be used to offset any loss of energy savings; as mutually agreed to by the Owner, DES Project Manager and McKinstry.

4.13 Insurance & Bonding

McKinstry shall provide a payment and performance bond and builders Risk Insurance.

For The Purposes of This Agreement, the "Sum Amount of Bond" Shall Be (See Table 4.1 – "Budget Summary Breakdown").

- 1. The bond amount consists of Labor and Materials and State Sales Tax.
- 2. This bond does not include any construction contingencies.
- 3. Certificates of General Liability Insurance will be provided prior to Contract Signing. The State Of Washington shall be named as An Additional Insured on all insurance certificates.



McKinstry shall provide a payment and performance bond in the amount of 100% of the construction cost, as defined in the Energy Services Agreement Addendum. The amount shall include all authorized changes and state sales tax. The Bond shall be in the form attached to the Conditions of the Energy Services Agreement. The Contract listed on the bond form shall be the Addendum No. and Agreement No., which incorporates the work, and the "Contract Date" shall be the date of the Addendum. The full and just sum of the Bond shall be as defined above and shall include the actual cost of purchasing and installing McKinstry's Equipment. The Bond shall specifically exclude coverage for those portions of the Energy Services Agreement and/or Energy Services Agreement Addendum pertaining to design services, energy cost savings guarantee, maintenance guarantee, utility incentives, efficiency guarantees, and any other clauses which do not relate specifically to construction management and supervision of work for purchasing and installing of McKinstry's Equipment, or for work to be accomplished by the Owner. The Bond shall be with a Surety or Bonding Company that is registered with the State of Washington Insurance Commissioner's Office.



Table 4.1 - Budget Summary

WA Governor's Mansion 2013 FINAL 3/7/2014

Scenario



Total Allotments \$

base D	FIM Name			Me	echanical		Electrical		EMCS	Lighting		General	Eq	uipment	Other		Total
.63	01 Provide Decentralized Boiler			\$	103,755	\$	21,750	\$	7,269	\$. \$	47,990	\$	47,537	\$ -	\$	228
<u> 167</u>	05 Upgrade Single Pane Glazing			\$	-	\$	-	\$	1,507	\$ -	. \$	27,577	\$	-	\$ -	\$	29
<u> 170</u>	08 Provide Demand Controlled Ventilation			\$	8,778	\$	8,800	\$	8,697	\$ -	. \$	394	\$	-	\$ -	\$	26
<u> 169</u>	09.01 Interior Lighting Upgrade			\$	-	\$			-	\$ -	. \$	-	\$	-	\$ -	\$	12
015	09.02 Exterior Lighting Upgrades			\$	-	\$			-	\$ -	. \$		\$	-	\$ -	\$	27
<u> 175</u>	13 Provide Domestic Hot Water Heater			\$	45,671			\$	-	\$ -	7		\$	-	\$ -	\$	48
<u> 581</u>	15 Recommissioning			\$	5,739	_		\$	-	\$ -	4		\$	-	\$ -	\$	5
<u> 298</u>	16 Commercial Dishwashers			\$	1,907		<u> </u>		-	, T	. \$		\$	22,793	\$ -		28
		Total	Base FIM Cost	\$	165,850	\$	76,890	\$	17,472	\$ -	- \$	76,684	\$	70,330	\$ -	\$	407
nstru	ction Costs																
i i sti u	Safety, Site Supervision	Lump	\$32,046													\$	32
	Subtotal(FIM Cost and A)	Lump	Ψ32,040													\$	439
	Construction Bonds	%	1.10%	Perc	ent of Subt	otal	(FIM Cost	and A)							\$	4
	Constitution Bends	7.0	212070		cite or bube	ocu.	(<u> </u>	,					Total Con	struction Cost	\$	444
ofessi	onal Services Costs																
	Audit Fee	Lump	\$29,611													\$	29
	Design	%	12.00%	Perc	ent of Subt	otal	(FIM Cost	and A)							\$	52
	Const. Management & Proj. Admin	%	6.00%	Perc	ent of Total	Cor	struction (Cost								\$	26
												To	otal Pr	rofessional	Services Cost	\$	108,
_																	
ner Pr	oject Costs	0.1	· ·													4	
	Project Contingency	%	5.00%	Perc	ent of Total	Cor	struction (Cost								\$	22
	Performance Assurance (3 Yr M&V)	Lump	\$27,783											Tatal Oth	Businet Cont	\$	27
														rotar Otne	er Project Cost	\$	49
erhea	d Costs & Fees																
erried	Overhead / Fee	%	18.00%	Perc	ent of Total	Cor	struction (Cost								\$	79
	overnedd i ee	70	10.00 %	1 010	circ or rotal		istraction .	0000					To	tal Overhe	ad Cost & Fee	\$	79
al Gu	aranteed Construction & ESCO Services (A + B	+ C + D)														\$	683
n-Gua	ranteed Costs																
	Sales Tax	%	8.80%	Perc	ent of Secti	ion E	. (Excludir	ng Cor	ntigency)							\$	58
	WA DES Project Management Fee	Lump	\$35,000													\$	35
	WA DES Performance Assurance (Yr 2 & 3)	Lump	\$4,000													\$	4
	Capitol Campus Site Rep	Lump	\$5,000													\$	5
													To	tal Non-Gu	aranteed Cost	\$	102
	nximum Project Cost (E + F)										_					\$	785



Table 4.2 - Facility Improvement Measure (FIM) Summary

Project WA Governor's Mansion 2013

cenario FINAL

Pate March 7, 2014

Facility Improvement Measures	FIM Description	Facility	Budget *	Annual Utility Savings	Annual Operational Savings **	Potential Incentives ***	Net Customer Cost (with Incentives)
01 Provide Decentralized Boiler	The intent of this measure is to provide a hot water boiler to serve the Governor's Residence independently of the campus central steam plant. Existing: A central steam plant currently provides the Governor's Residence with heating energy via a steam converter located within the building basement. The central steam boilers operate 24 hours a day to maintain 120 lb steam pressure within the mains, even during periods of little to no campus heating energy demand. This operation leads to significant standby and transmission losses. Proposed: Provide a condensing boiler dedicated to heating the Governor's Residence, including heating water piping, combustion air and flue ducts, power, controls, and appurtenances. Benefits: Natural gas savings will be realized by replacing the steam service with a natural gas fired condensing boiler, which has greater combustion efficiency and less transmission losses than the central steam plant.	WA State Governor's Residence	\$440,176	\$4,009	\$0	\$0	\$440,176
05 Interior Storm Windows	The intent of this measure is to provide storm windows installed on the inside face of the existing glazing. Existing: The existing windows are original to the building. These windows are single pane and have poor thermal and shading performance and air sealing. Proposed: Provide window inserts to be installed on the inside face of the existing glazing. Benefits: Energy savings will be realized by reducing solar heat gain, improving the glazing thermal performance, reducing infiltration due to air leakage, and increasing room mean radiant temperature.	WA State Governor's Residence	\$56,073	\$1,213	\$0	\$0	\$56,073
08 Provide Demand Controlled Ventilation	The intent of this measure is to provide CO2 based demand controlled ventilation for the chilled water air handling units serving the occupied areas of the Governor's Residence. Existing: The existing air handling units do not have a means of reducing airflows to match the building occupancy. Proposed: Provide room sensor based demand controlled ventilation for the chilled water air handling units, including sensors, controls, commissioning, and appurtenances. Benefits: Heating and cooling energy usage associated with the conditioning of ventilation air will be reduced through reducing ventilation rates to match building occupancy.	WA State Governor's Residence	\$51,418	\$3,992	\$0	\$15,208	\$36,210
09.01 Interior Lighting Upgrade	Existing: The existing fixtures use traditional incandescent lamps in a variety of fixture types. These lamps consume higher energy, are inefficient at converting energy into light, and have a lower life expectancy than modern lamp technologies. Additionally, there are several fixtures with older technology linear fluorescent lamps which consume more energy than newer types. Proposed: Replace each incandescent lamp with an LED equivalent and maintain the existing fixture. Lighting controls will remain. The T12 linear fluorescent fixtures shall be retrofitted to T8 lamps and electronic ballasts. Replace T12 undercabinet lighting in the 2nd Floor Kitchen with LED replacements. All existing compact fluorescent 2 and 4-pin connection types will remain. Benefits: LED lighting provides improved efficacy, efficiency, and operational life compared to traditional incandescent lamp types. New, lower wattage T8 linear fluorescent fixtures will produce improved light quality compared to the existing T12, while	WA State Governor's Residence	\$24,004	\$1,352	\$667	\$9,731	\$14,273

Facility Improvement Measures	FIM Description	Facility	Budget *	Annual Utility Savings	Annual Operational Savings **	Potential Incentives ***	Net Customer Cost (with Incentives)
09.02 Exterior Lighting Upgrades	The intent of this measure is to upgrade existing HID lighting with LED equivalent alternatives. Existing: There are several variations of both high pressure sodium and incandescent fixtures that serve the exterior grounds and driveway. Each area of the campus lighting is controlled by either a timeclock or Metasys controls system depending on the location. Proposed: Perform a one-for one LED retrofit or replacement of the selected fixture as indicated within the Lighting Spreadsheet. Lighting Controls scheme will remain. Benefits: LED lighting provides improved efficacy, efficiency, and operational life compared to traditional HID lamp types.	WA State Governor's Residence	\$52,732	\$756	\$172	\$6,199	\$46,533
13 Provide Domestic Hot Water Heater	The intent of this measure is to replace the existing domestic water heater with a condensing domestic water heater. Existing: Domestic water heating is provided by a domestic water storage tank with integral steam heat exchanger. Proposed: Provide a condensing instantaneous domestic water heater to replace the steam water heater, including, piping, expansion tank, controls, and appurtenances. Benefits: Domestic water heating energy usage will be reduced through improving the combustion efficiency and reducing standby losses of the domestic water heaters.	WA State Governor's Residence	\$94,269	\$118	\$0	\$0	\$94,269
15 Recommissioning	This measure addresses the recommissioning of the existing HVAC systems and controls, the air handling units, baseboard convectors, exhaust fans, chilled water system, and control valves. Existing Condition: The Residence is served by multiple constant volume chilled water air handling units, hydronic baseboard convectors, and other equipment. This equipment was observed to have multiple operations issues, including operating 24 hours a day regardless of building occupancy as well as a lack of nighttime temperature setback. Proposed Condition: Provide retrocommissioning of the facility HVAC systems, including air handlers and baseboard convectors. Provide updated controls sequences for the Residence and Powerhouse chilled water plant such that after hours calls for cooling utilize the airside economizer as the first stage of cooling, the thermal mass of the chilled water loop as the second stage, and the water cooled chillers as the third stage. Benefits: Energy savings will be realized through the rebalancing of the air handling unit air economizers, adjusting equipment run hours to match building occupancy, and implementing nighttime temperature setback.	WA State Governor's Residence	\$11,065	\$1,002	\$0	\$0	\$11,065
16 Commercial Dishwashers	This measure includes replacing the existing low temperature commercial dishwashers with new units that incorporate internal booster heaters. The low temperature units utilize chemical sterilizers which cannot be used with sterling silver flatware. Additionally, the low temperature units require hand drying glassware to avoid water spotting.	WA State Governor's Residence	\$55,414	\$0	\$0	\$0	\$55,414
		Totals	\$785,152	\$12,443	\$839	\$31,138	\$754,014

^{*} Since design cost, audit cost, etc. are distributed among the FIMs, the total project cost will not go up or down by exactly the amounts shown here if a FIM or FIMs are dropped.

** For non recurring operational savings, the values are averaged over the 30 year length of this analysis.

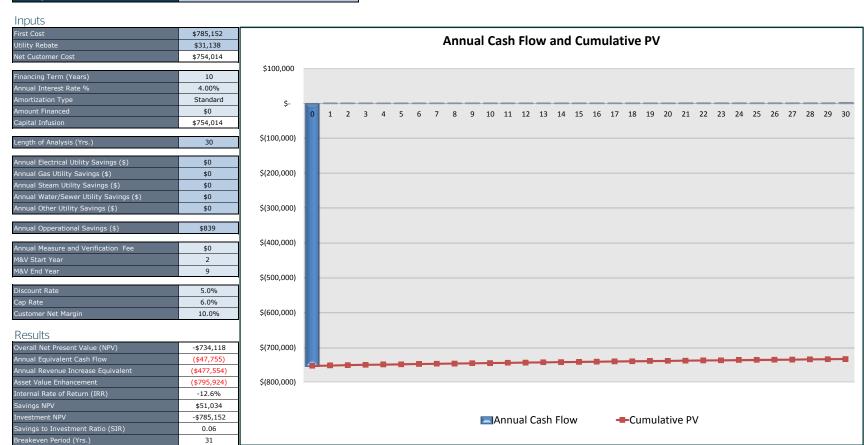
*** Incentives are contingent on final approval and are not guaranteed. Funds are shown for reference only.

Confidential and Proprietary



Table 4.3 - Cash Flow Analysis

Project:	P10853
Scenario:	FINAL
Report Date:	March 7, 2014
Financing Source:	TBD



Cash Flow Analysis:																										
Period	Escalation	0	1		2	3	4	5	6		7	8	9		10	11	12	13	14	15	1	6	17	18	19	20
First Cost Minus Financed Amount		\$ (785,15	52)																							•
Rebate		\$ 31,13	88																							
Other Grants and Incentives		\$ 50	00 \$	- \$	500 \$	-	\$ -	\$ -	\$	- \$	- \$	-	\$ -	\$	- \$	-	\$ -	\$ -	\$ -	\$ -	\$	- \$	- :	\$ -	\$ -	\$ -
Loan Payments			\$	- \$	- \$	-	\$ -	\$ -	\$	- \$	- \$	-	\$ -	\$	- \$	-	\$ -	\$ -	\$ -	\$ -	\$	- \$	-	\$ -	\$ -	\$ -
Annual Electrical Utility Savings (\$)	4.0%		\$	- \$	- \$		\$ -	\$ -	\$	- \$	- \$	-	\$ -	\$	- \$; -	\$ -	\$ -	\$ -	\$ -	\$	- \$	-	\$ -	\$ -	\$ -
Annual Gas Utility Savings (\$)	3.0%		\$	- \$	- \$	-	\$ -	\$ -	\$	- \$	- \$	-	\$ -	\$	- \$	-	\$ -	\$ -	\$ -	\$ -	\$	- \$	- :	\$ -	\$ -	\$ -
Annual Steam Utility Savings (\$)	4.0%		\$	- \$	- \$	-	\$ -	\$ -	\$	- \$	- \$	-	\$ -	\$	- \$	-	\$ -	\$ -	\$ -	\$ -	\$	- \$	- :	\$ -	\$ -	\$ -
Annual Water/Sewer Utility Savings (\$)	3.0%		\$	- \$	- \$	-	\$ -	\$ -	\$	- \$	- \$	-	\$ -	\$	- \$	-	\$ -	\$ -	\$ -	\$ -	\$	- \$	- :	\$ -	\$ -	\$ -
Annual Other Utility Savings (\$)	2.0%		\$	- \$	- \$	-	\$ -	\$ -	\$	- \$	- \$	-	\$ -	\$	- \$	-	\$ -	\$ -	\$ -	\$ -	\$	- \$	-	\$ -	\$ -	\$ -
Total Operational Savings (Today's Dollars)	1		\$	839 \$	839 \$	839	\$ 839	\$ 83	9 \$	839 \$	839 \$	839	\$ 839	9 \$	839 \$	839	\$ 839	\$ 839	\$ 839	\$ 8	39 \$	839 \$	839	\$ 839	\$ 8	39 \$ 839
Operational Savings (Today's Dollars)			\$	839 \$	839 \$	839	\$ 839	\$ 83	9 \$	839 \$	839 \$	839	\$ 839	9 \$	839 \$	839	\$ 839	\$ 839	\$ 839	\$ 8	39 \$	839 \$	839	\$ 839	\$ 8	39 \$ 839
Operational Savings (Escalated)	3.0%		\$	864 \$	890 \$	917	\$ 944	\$ 97	3 \$ 1	,002 \$	1,032	1,063	\$ 1,095	5 \$	1,128 \$	1,161	\$ 1,196	\$ 1,232	\$ 1,269	\$ 1,3	07 \$	1,346 \$	1,387	\$ 1,428	\$ 1,4	71 \$ 1,515
M&V Fee	2.0%		\$	- \$	- \$	-	\$ -	\$ -	\$	- \$	- \$	-	\$ -	\$	- \$	-	\$ -	\$ -	\$ -	\$ -	\$	- \$	- :	\$ -	\$ -	\$ -
Annual Cash Flow		\$ (753,51	4) \$	864 \$	1,390 \$	917	\$ 944	\$ 97	3 \$ 1	,002 \$	1,032 \$	1,063	\$ 1,095	5 \$	1,128 \$	1,161	\$ 1,196	\$ 1,232	\$ 1,269	\$ 1,3	07 \$	1,346 \$	1,387	\$ 1,428	\$ 1,4	71 \$ 1,515
Present Value (PV) Factor		1.00	0.95	0	0.91	0.86	0.82	0.78	0.75		0.71	0.68	0.64		0.61	0.58	0.56	0.53	0.51	0.48	0.4	16	0.44	0.42	0.40	0.38
Annual PV		(\$753,514)	\$823	\$1	1,261	\$792	\$777	\$762	\$748		\$733	\$719	\$706	9	\$692	\$679	\$666	\$653	\$641	\$629	\$6	17	\$605	\$594	\$582	\$571
Cumulative PV		(\$753,514)	(\$752,69	1) (\$75	51,430)	(\$750,638)	(\$749,861)	(\$749,099)	(\$748,3	51) (\$7	747,618)	(\$746,899)	(\$746,193)	(\$7	45,501)	(\$744,822)	(\$744,156)	(\$743,502)	(\$742,861)	(\$742,232) (\$741	,616) (\$741,011)	(\$740,417)	(\$739,835	(\$739,264)

Section 5.0 Directed Engineering Study

Table of Contents

SECTION 5.1 PURPOSE AND ORGANIZATION

SECTION 5.2 EXISTING FACILITY DESCRIPTION

SECTION 5.3 FACILITY IMPROVEMENT MEASURES - CALCULATIONS

SECTION 5.4 FACILITY IMPROVEMENT MEASURES - ADDITIONAL SCOPE DOCUMENTS

MECHANICAL SCOPE SKETCHES

MECHANICAL CUT SHEETS

PLUMBING SCOPE SKETCHES

SECTION 5.5 FIM'S CONSIDERED BUT NOT USED

SECTION 5.6 UTILITY DATA

UTILITY DATA ANALYSIS

ENERGY USE INDEX ANALYSIS

ENVIRONMENTAL IMPACT

SECTION 5.7 HVAC SYSTEM DATA & TEST TRENDS

SECTION 5.8 AUGUST 2013 INVESTMENT GRADE AUDIT REPORT



5.1 PURPOSE AND ORGANIZATION

This exhibit documents the analysis performed to establish the utility and operational savings for the project.

The information is organized by FIM (Facility Improvement Measure) as follows:

- FIM Narrative with key assumptions and criteria
- Savings calculation methodology and analysis

Additionally, relevant site survey data, measurement and verification data, utility information and miscellaneous back-up information are provided in the sections following the various FIM sections.

5.2 EXISTING FACILITY DESCRIPTION

WASHINGTON GOVERNORS MANSION

GENERAL FACILITY DISCRIPTION

The facility is located on the Washington State Capitol Campus in Olympia, WA. The total building area is approximately 21,400 square feet, and contains three above-grade floors and one below grade floor. The building was completed in 1908 and renovated most recently in 2000. The exterior walls consist of brick masonry. The roof of the original building consists of a wood framed pitched roof topped with composite shingles. The roof of the building expansion consists of a flat pitched membrane type roof. Exterior windows consist of operable single-pane glazing. The first floor of the mansion is dedicated to hosting State events and functions and is a public space. The second and third floors are residential levels, with the second floor containing the Governor's residence and the third floor containing guest rooms and storage rooms. The basement contains support areas including the laundry room, storage rooms, a conference room, and mechanical rooms. The facility is scheduled occupied 24 hours per day, 7 days a week, although the building is typically most active from 8 am to 5 pm and during scheduled events.



Electricity and natural gas is provided by Puget Sound Energy. The facility is provided steam by the steam boilers located at the Powerhouse building, and chilled water provided by the water cooled chillers also at the Powerhouse building. The natural gas currently only serves the ground floor kitchen.



HEATING WATER LOOP

Heating energy is distributed throughout the facility by a heating water loop serving heating coils located in the air handling units, zone reheat coils, and baseboard convectors.

The heating water loop is circulated by four constant volume circulation pumps which operate 24 hours a day. Two pumps circulate water through a loop serving the baseboards, and two pumps circulate water thru a loop serving the hot water heating coils. Each pair of pumps operate in a primary/standby arrangement. Heat is supplied to the loop via a steam converter with steam provided by steam boilers located in the Powerhouse building. The steam converter is oversized by at least a factor of two. The steam delivery rate is controlled by a modulating control valve. On the heating water loop side one three-way bypass valve and one two-way bypass valve modulates to maintain the heating supply water temperatures. The baseboards and heat coils are equipped with modulating control valves coupled with zone temperature sensors.

CHILLED WATER LOOP

Cooling energy is distributed throughout the building by a chilled water loop serving cooling coils located in the air handling units.

Chilled water is circulated by a single constant volume circulation pumps which is enabled when there is a demand for mechanical cooling. Three-way valves at the chilled water cooling coils modulate chilled water flow rates to meet zone mechanical cooling demands.



Steam converter and circulation pumps serving reheat coils and baseboard convectors

AIR HANDLING UNITS

The building is conditioned by eight constant volume air handling units. All units have constant volume supply and hot water heating coils. Seven of eight units have chilled water cooling coils; the unit serving the basement does not have mechanical cooling capabilities. Seven of eight units have airside economizers; the unit serving the first floor ballroom is a 100% outside air unit and does not have the capability to reduce ventilation air delivery rates. All units are enabled 24 hours a day. Four of the eight units a single zone units, and the other four are multi-zone units, with zone temperatures controlled by duct hot water reheat coils. Heating temperature setpoints are 72°F when occupied and 60°F when unoccupied. Cooling temperature setpoints are 74°F when occupied and 80°F when unoccupied. All units are enabled 24 hours per day, so the space is always conditioned to the occupied temperature setpoints. The air handlers serving the building are as follows:

- FC-001: 4,000 CFM fancoil unit with airside economizer and hydronic heating coil serving the basement
- FC-101: 2,000 CFM 100% outside air fancoil unit with hydronic heating coil and chilled water cooling coil serving the ballroom



Fancoil units FC-102 and FC-104, located in the basement mechanical room

- FC-102: 1,700 CFM fancoil unit with airside economizer, hydronic heating coil, and chilled water cooling coil serving the dining room
- FC-103: 2,040 CFM fancoil unit with airside economizer, hydronic heating coil, and chilled water cooling coil serving the library, sitting room, and entry
- FC-104: 2,700 CFM fancoil unit with airside economizer, hydronic heating coil, and chilled water cooling coil serving the parlor, hall, and sun room
- FC-105: 1,640 CFM fancoil unit with airside economizer, hydronic heating coil, and chilled water cooling coil serving the kitchen



- FC-201: 1,400 CFM fancoil unit with airside economizer, hydronic heating coil, and chilled water cooling coil serving the 2nd floor family room and master bedroom
- FC-202: 1,820 CFM fancoil unit with airside economizer, hydronic heating coil, and chilled water cooling coil serving the 2nd floor east and south bedrooms

In addition to the air handling units, perimeter spaces are conditioned by hydronic convectors installed along the exterior walls under selected windows. Heat output is controlled by modulating control valves controlled by the building management system via zone temperature sensors.

The third floor is not mechanically ventilated and is conditioned solely by way of baseboard convectors.

DOMESTIC WATER HEATERS

Domestic hot water is provided by an AO Smith hot water heater served by campus steam. An electric domestic water heater provides backup domestic hot water when steam is not available or the primary heater is being serviced. A domestic water circulation pump is enabled 24 hours a day and allows for greatly reduced hot water delivery times to water fixtures. The building management system controls the domestic hot water system to maintain the domestic hot water supply temperature setpoint of 115°F.

CONTROL SYSTEM

The majority of the facility equipment and scheduling is controlled by a Johnson Controls Metasys building management system that also controls the majority of the facilities at the Capitol Campus. Mechanical equipment not currently controlled by the building management system includes the electric domestic tank water heater and the domestic hot water booster heater serving the ground floor kitchen.



125 gallon steam domestic water heater located in basement mechanical room

LIGHTING

The lighting of the majority of interior building spaces consists predominantly of incandescent lamps mounted in a decorative pendant, chandelier, track, and recessed downlight fixtures. In addition to the incandescent lamps there are smaller quantities of halogen lamps , mounted in ceiling mounted track and recessed downlight fixtures. The first floor kitchen contains ceiling mounted 32 watt T8 fluorescent lamps with electronic ballasts, mounted in prismatic fixtures. Restroom lighting consists of a mixture of incandescent ceiling mounted downlights and chandeliers and vanity lighting with incandescent lamps or 34 watt T12 fluorescent lamps with magnetic ballasts.

Exterior lighting consists of a mixture flood lighting with 250 watt high pressure sodium lamps and magnetic ballasts, sconce lighting with compact fluorescent lamps, and guard shack and carport lighting consisting of T8 and T12 fluorescent lamps mounted in industrial fixtures.



5.3 FIMS - CALCULATIONS



Facility Improvement Measure (FIM) Detail

Project	WA Governor's Residence
Scenario	FINAL
Date	December 2, 2013



FIM ID 20163 Facility WA Governors Mansion	
--	--

FIM Name 01 Provide Decentralized Boiler

FIM Description

The intent of this measure is to provide a hot water boiler to serve the Governor's Residence independently of the campus central steam plant.

Existing: A central steam plant currently provides the Governor's Residence with heating energy via a steam converter located within the building basement. The central steam boilers operate 24 hours a day to maintain 120 lb steam pressure within the mains, even during periods of little to no campus heating energy demand. This operation leads to significant standby and transmission losses.

Proposed: Provide a condensing boiler dedicated to heating the Governor's Residence, including heating water piping, combustion air and flue ducts, power, controls, and appurtenances.

Benefits: Natural gas savings will be realized by replacing the steam service with a natural gas fired condensing boiler, which has greater combustion efficiency and less transmission losses than the central steam plant.

Savings Methodology

Annual savings is calculated using a bin calculation calibrated to match the consumption recorded by the steam, electric, and chilled water submeters serving the residence. Baseline heating system efficiency is based on an analysis of the powerhouse steam system standby losses performed in 2006. The proposed heating system efficiency is based on the combustion efficiency of a Hydrotherm KN series boiler at 140 F return water temperature.

Utility Savings			
Utility Type	Utility Unit	Quantity Savings	Dollar Savings
Electricity	kWh	0	\$0
Electric Demand	kW	0	\$0
Natural Gas	Therm	7,036	\$4,009
Water	kgal	0	\$0
Sewer	kgal	0	\$0
Total			\$4,009

Confidential & Proprietary

McK8760 - HVAC Schedules

O1 Provide Decentralized Boiler



1 = Scheduled ON

Baseline HVAC Equipment Daily Schedules

	Baseline - A - Weekly Schedule									
Н	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То	1	2	3	4	5	6	7		
0	1	1	1	1	1	1	1	1		
1	2	1	1	1	1	1	1	1		
2	3	1	1	1	1	1	1	1		
3	4	1	1	1	1	1	1	1		
4	5	1	1	1	1	1	1	1		
5	6	1	1	1	1	1	1	1		
6	7	1	1	1	1	1	1	1		
7	8	1	1	1	1	1	1	1		
8	9	1	1	1	1	1	1	1		
9	10	1	1	1	1	1	1	1		
10	11	1	1	1	1	1	1	1		
11	12	1	1	1	1	1	1	1		
12	13	1	1	1	1	1	1	1		
13	14	1	1	1	1	1	1	1		
14	15	1	1	1	1	1	1	1		
15	16	1	1	1	1	1	1	1		
16	17	1	1	1	1	1	1	1		
17	18	1	1	1	1	1	1	1		
18	19	1	1	1	1	1	1	1		
19	20	1	1	1	1	1	1	1		
20	21	1	1	1	1	1	1	1		
21	22	1	1	1	1	1	1	1		
22	23	1	1	1	1	1	1	1		
23	24	1	1	1	1	1	1	1		
Daily	Totals	24	24	24	24	24	24	24		

	Baseline - B - Not Applicable								
Н	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat	
From	То	1	2	3	4	5	6	7	
0	1	0	0	0	0	0	0	0	
1	2	0	0	0	0	0	0	0	
2	3	0	0	0	0	0	0	0	
3	4	0	0	0	0	0	0	0	
4	5	0	0	0	0	0	0	0	
5	6	0	0	0	0	0	0	0	
6	7	0	0	0	0	0	0	0	
7	8	0	1	1	1	1	1	0	
8	9	0	1	1	1	1	1	0	
9	10	0	1	1	1	1	1	0	
10	11	0	1	1	1	1	1	0	
11	12	0	1	1	1	1	1	0	
12	13	0	1	1	1	1	1	0	
13	14	0	1	1	1	1	1	0	
14	15	0	1	1	1	1	1	0	
15	16	0	1	1	1	1	1	0	
16	17	0	0	0	0	0	0	0	
17	18	0	0	0	0	0	0	0	
18	19	0	0	0	0	0	0	0	
19	20	0	0	0	0	0	0	0	
20	21	0	0	0	0	0	0	0	
21	22	0	0	0	0	0	0	0	
22	23	0	0	0	0	0	0	0	
23	24	0	0	0	0	0	0	0	
Daily	Totals	0	9	9	9	9	9	0	

			seline -	C - Not						
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То	1	2	3	4	5	6	7		
0	1	0	0	0	0	0	0	0		
1	2	0	0	0	0	0	0	0		
2	3	0	0	0	0	0	0	0		
3	4	0	0	0	0	0	0	0		
4	5	0	0	0	0	0	0	0		
5	6	0	0	0	0	0	0	0		
6	7	0	0	0	0	0	0	0		
7	8	0	0	0	0	0	0	0		
8	9	0	0	0	0	0	0	0		
9	10	0	1	1	1	1	1	0		
10	11	0	1	1	1	1	1	0		
11	12	0	1	1	1	1	1	0		
12	13	0	1	1	1	1	1	0		
13	14	0	1	1	1	1	1	0		
14	15	0	1	1	1	1	1	0		
15	16	0	0	0	0	0	0	0		
16	17	0	0	0	0	0	0	0		
17	18	0	0	0	0	0	0	0		
18	19	0	0	0	0	0	0	0		
19	20	0	0	0	0	0	0	0		
20	21	0	0	0	0	0	0	0		
21	22	0	0	0	0	0	0	0		
22	23	0	0	0	0	0	0	0		
23	24	0	0	0	0	0	0	0		
Daily	Totals	0	6	6	6	6	6	0		

0 = Schedule OFF

Proposed HVAC Equipment Daily Schedules

		Prop	osed - A	A - Weel	kly Sche	dule		
Но	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То					5		
0	1	1	1	1	1	1	1	1
1	2	1	1	1	1	1	1	1
2	3	1	1	1	1	1	1	1
3	4	1	1	1	1	1	1	1
4	5	1	1	1	1	1	1	1
5	6	1	1	1	1	1	1	1
6	7	1	1	1	1	1	1	1
7	8	1	1	1	1	1	1	1
8	9	1	1	1	1	1	1	1
9	10	1	1	1	1	1	1	1
10	11	1	1	1	1	1	1	1
11	12	1	1	1	1	1	1	1
12	13	1	1	1	1	1	1	1
13	14	1	1	1	1	1	1	1
14	15	1	1	1	1	1	1	1
15	16	1	1	1	1	1	1	1
16	17	1	1	1	1	1	1	1
17	18	1	1	1	1	1	1	1
18	19	1	1	1	1	1	1	1
19	20	1	1	1	1	1	1	1
20	21	1	1	1	1	1	1	1
21	22	1	1	1	1	1	1	1
22	23	1	1	1	1	1	1	1
23	24	1	1	1	1	1	1	1
Daily	Totals	24	24	24	24	24	24	24

	Proposed - B - Not Applicable								
Н	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat	
From	То	1	2	3	4	5	6	7	
0	1	0	0	0	0	0	0	0	
1	2	0	0	0	0	0	0	0	
2	3	0	0	0	0	0	0	0	
3	4	0	0	0	0	0	0	0	
4	5	0	0	0	0	0	0	0	
5	6	0	0	0	0	0	0	0	
6	7	0	0	0	0	0	0	0	
7	8	0	1	1	1	1	1	0	
8	9	0	1	1	1	1	1	0	
9	10	0	1	1	1	1	1	0	
10	11	0	1	1	1	1	1	0	
11	12	0	1	1	1	1	1	0	
12	13	0	1	1	1	1	1	0	
13	14	0	1	1	1	1	1	0	
14	15	0	1	1	1	1	1	0	
15	16	0	1	1	1	1	1	0	
16	17	0	0	0	0	0	0	0	
17	18	0	0	0	0	0	0	0	
18	19	0	0	0	0	0	0	0	
19	20	0	0	0	0	0	0	0	
20	21	0	0	0	0	0	0	0	
21	22	0	0	0	0	0	0	0	
22	23	0	0	0	0	0	0	0	
23	24	0	0	0	0	0	0	0	
Daily	Totals	0	9	9	9	9	9	0	

O - Schodulo OFF	1 - Schoduled ON

	Proposed - C - Not Applicable								
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat	
From	То	1	2	3	4	5	6	7	
0	1	0	0	0	0	0	0	0	
1	2	0	0	0	0	0	0	0	
2	3	0	0	0	0	0	0	0	
3	4	0	0	0	0	0	0	0	
4	5	0	0	0	0	0	0	0	
5	6	0	0	0	0	0	0	0	
6	7	0	0	0	0	0	0	0	
7	8	0	0	0	0	0	0	0	
8	9	0	0	0	0	0	0	0	
9	10	0	1	1	1	1	1	0	
10	11	0	1	1	1	1	1	0	
11	12	0	1	1	1	1	1	0	
12	13	0	1	1	1	1	1	0	
13	14	0	1	1	1	1	1	0	
14	15	0	1	1	1	1	1	0	
15	16	0	0	0	0	0	0	0	
16	17	0	0	0	0	0	0	0	
17	18	0	0	0	0	0	0	0	
18	19	0	0	0	0	0	0	0	
19	20	0	0	0	0	0	0	0	
20	21	0	0	0	0	0	0	0	
21	22	0	0	0	0	0	0	0	
22	23	0	0	0	0	0	0	0	
23	24	0	0	0	0	0	0	0	
Daily	Totals	0	6	6	6	6	6	0	

McK8760 - Occupancy Schedules

O1 Provide Decentralized Boiler



Baseline Occupancy Load Profiles (Percent of Peak Occupancy)

	Baseline - A - Weekly Schedule									
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То		2							
0	1	20%	20%	20%	20%	20%	20%	20%		
1	2	20%	20%	20%	20%	20%	20%	20%		
2	3	20%	20%	20%	20%	20%	20%	20%		
3	4	20%	20%	20%	20%	20%	20%	20%		
4	5	20%	20%	20%	20%	20%	20%	20%		
5	6	20%	20%	20%	20%	20%	20%	20%		
6	7	20%	20%	20%	20%	20%	20%	20%		
7	8	20%	20%	20%	20%	20%	20%	20%		
8	9	20%	20%	20%	20%	20%	20%	20%		
9	10	90%	90%	90%	90%	90%	90%	90%		
10	11	90%	90%	90%	90%	90%	90%	90%		
11	12	80%	80%	80%	80%	80%	80%	80%		
12	13	80%	80%	80%	80%	80%	80%	80%		
13	14	80%	80%	80%	80%	80%	80%	80%		
14	15	80%	80%	80%	80%	80%	80%	80%		
15	16	45%	45%	45%	45%	45%	45%	45%		
16	17	20%	20%	20%	20%	20%	20%	20%		
17	18	20%	20%	20%	20%	20%	20%	20%		
18	19	20%	20%	20%	20%	20%	20%	20%		
19	20	20%	20%	20%	20%	20%	20%	20%		
20	21	20%	20%	20%	20%	20%	20%	20%		
21	22	20%	20%	20%	20%	20%	20%	20%		
22	23	20%	20%	20%	20%	20%	20%	20%		
23	24	20%	20%	20%	20%	20%	20%	20%		

Baseline - B - Not Applicable											
Ho	ur	Sun	Mon	Tue	Wed	Thu	Fri	Sat			
From	То	1	2	3	4	5	6				
0	1	0%	0%	0%	0%	0%	0%	0%			
1	2	0%	0%	0%	0%	0%	0%	0%			
2	3	0%	0%	0%	0%	0%	0%	0%			
3	4	0%	0%	0%	0%	0%	0%	0%			
4	5	0%	0%	0%	0%	0%	0%	0%			
5	6	0%	0%	0%	0%	0%	0%	0%			
6	7	0%	0%	0%	0%	0%	0%	0%			
7	8	0%	2%	2%	2%	2%	2%	0%			
8	9	0%	35%	35%	35%	35%	35%	0%			
9	10	0%	45%	45%	45%	45%	45%	0%			
10	11	0%	45%	45%	45%	45%	45%	0%			
11	12	0%	40%	40%	40%	40%	40%	0%			
12	13	0%	40%	40%	40%	40%	40%	0%			
13	14	0%	40%	40%	40%	40%	40%	0%			
14	15	0%	40%	40%	40%	40%	40%	0%			
15	16	0%	25%	25%	25%	25%	25%	0%			
16	17	0%	2%	2%	2%	2%	2%	0%			
17	18	0%	0%	0%	0%	0%	0%	0%			
18	19	0%	0%	0%	0%	0%	0%	0%			
19	20	0%	0%	0%	0%	0%	0%	0%			
20	21	0%	0%	0%	0%	0%	0%	0%			
21	22	0%	0%	0%	0%	0%	0%	0%			
22	23	0%	0%	0%	0%	0%	0%	0%			
23	24	0%	0%	0%	0%	0%	0%	0%			

	Baseline - C - Not Applicable										
Но	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat			
From	То	1	2	3	4	5	6	7			
0	1	0%	0%	0%	0%	0%	0%	0%			
1	2	0%	0%	0%	0%	0%	0%	0%			
2	3	0%	0%	0%	0%	0%	0%	0%			
3	4	0%	0%	0%	0%	0%	0%	0%			
4	5	0%	0%	0%	0%	0%	0%	0%			
5	6	0%	0%	0%	0%	0%	0%	0%			
6	7	0%	0%	0%	0%	0%	0%	0%			
7	8	0%	2%	2%	2%	2%	2%	0%			
8	9	0%	5%	5%	5%	5%	5%	0%			
9	10	0%	5%	5%	5%	5%	5%	0%			
10	11	0%	5%	5%	5%	5%	5%	0%			
11	12	0%	5%	5%	5%	5%	5%	0%			
12	13	0%	5%	5%	5%	5%	5%	0%			
13	14	0%	5%	5%	5%	5%	5%	0%			
14	15	0%	5%	5%	5%	5%	5%	0%			
15	16	0%	2%	2%	2%	2%	2%	0%			
16	17	0%	2%	2%	2%	2%	2%	0%			
17	18	0%	0%	0%	0%	0%	0%	0%			
18	19	0%	0%	0%	0%	0%	0%	0%			
19	20	0%	0%	0%	0%	0%	0%	0%			
20	21	0%	0%	0%	0%	0%	0%	0%			
21	22	0%	0%	0%	0%	0%	0%	0%			
22	23	0%	0%	0%	0%	0%	0%	0%			
23	24	0%	0%	0%	0%	0%	0%	0%			

Proposed Occupancy Load Profiles (Percent of Peak Occupancy)

			, <u> </u>								
	Proposed - A - Weekly Schedule										
Но	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat			
From	То	1	2	3	4	5	6	7			
0	1	20%	20%	20%	20%	20%	20%	20%			
1	2	20%	20%	20%	20%	20%	20%	20%			
2	3	20%	20%	20%	20%	20%	20%	20%			
3	4	20%	20%	20%	20%	20%	20%	20%			
4	5	20%	20%	20%	20%	20%	20%	20%			
5	6	20%	20%	20%	20%	20%	20%	20%			
6	7	20%	20%	20%	20%	20%	20%	20%			
7	8	20%	20%	20%	20%	20%	20%	20%			
8	9	20%	20%	20%	20%	20%	20%	20%			
9	10	90%	90%	90%	90%	90%	90%	90%			
10	11	90%	90%	90%	90%	90%	90%	90%			
11	12	80%	80%	80%	80%	80%	80%	80%			
12	13	80%	80%	80%	80%	80%	80%	80%			
13	14	80%	80%	80%	80%	80%	80%	80%			
14	15	80%	80%	80%	80%	80%	80%	80%			
15	16	45%	45%	45%	45%	45%	45%	45%			
16	17	20%	20%	20%	20%	20%	20%	20%			
17	18	20%	20%	20%	20%	20%	20%	20%			
18	19	20%	20%	20%	20%	20%	20%	20%			
19	20	20%	20%	20%	20%	20%	20%	20%			
20	21	20%	20%	20%	20%	20%	20%	20%			
21	22	20%	20%	20%	20%	20%	20%	20%			
22	23	20%	20%	20%	20%	20%	20%	20%			
23	24	20%	20%	20%	20%	20%	20%	20%			

Proposed - B - Not Applicable										
Ho	ur	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То	1	2	3	4	5	6	7		
0	1	0%	0%	0%	0%	0%	0%	0%		
1	2	0%	0%	0%	0%	0%	0%	0%		
2	3	0%	0%	0%	0%	0%	0%	0%		
3	4	0%	0%	0%	0%	0%	0%	0%		
4	5	0%	0%	0%	0%	0%	0%	0%		
5	6	0%	0%	0%	0%	0%	0%	0%		
6	7	0%	0%	0%	0%	0%	0%	0%		
7	8	0%	2%	2%	2%	2%	2%	0%		
8	9	0%	35%	35%	35%	35%	35%	0%		
9	10	0%	45%	45%	45%	45%	45%	0%		
10	11	0%	45%	45%	45%	45%	45%	0%		
11	12	0%	40%	40%	40%	40%	40%	0%		
12	13	0%	40%	40%	40%	40%	40%	0%		
13	14	0%	40%	40%	40%	40%	40%	0%		
14	15	0%	40%	40%	40%	40%	40%	0%		
15	16	0%	25%	25%	25%	25%	25%	0%		
16	17	0%	2%	2%	2%	2%	2%	0%		
17	18	0%	0%	0%	0%	0%	0%	0%		
18	19	0%	0%	0%	0%	0%	0%	0%		
19	20	0%	0%	0%	0%	0%	0%	0%		
20	21	0%	0%	0%	0%	0%	0%	0%		
21	22	0%	0%	0%	0%	0%	0%	0%		
22	23	0%	0%	0%	0%	0%	0%	0%		
23	24	0%	0%	0%	0%	0%	0%	0%		

	Proposed - C - Not Applicable										
Но	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat			
From	То	1	2	3	4	5	6	7			
0	1	0%	0%	0%	0%	0%	0%	0%			
1	2	0%	0%	0%	0%	0%	0%	0%			
2	3	0%	0%	0%	0%	0%	0%	0%			
3	4	0%	0%	0%	0%	0%	0%	0%			
4	5	0%	0%	0%	0%	0%	0%	0%			
5	6	0%	0%	0%	0%	0%	0%	0%			
6	7	0%	0%	0%	0%	0%	0%	0%			
7	8	0%	2%	2%	2%	2%	2%	0%			
8	9	0%	5%	5%	5%	5%	5%	0%			
9	10	0%	5%	5%	5%	5%	5%	0%			
10	11	0%	5%	5%	5%	5%	5%	0%			
11	12	0%	5%	5%	5%	5%	5%	0%			
12	13	0%	5%	5%	5%	5%	5%	0%			
13	14	0%	5%	5%	5%	5%	5%	0%			
14	15	0%	5%	5%	5%	5%	5%	0%			
15	16	0%	2%	2%	2%	2%	2%	0%			
16	17	0%	2%	2%	2%	2%	2%	0%			
17	18	0%	0%	0%	0%	0%	0%	0%			
18	19	0%	0%	0%	0%	0%	0%	0%			
19	20	0%	0%	0%	0%	0%	0%	0%			
20	21	0%	0%	0%	0%	0%	0%	0%			
21	22	0%	0%	0%	0%	0%	0%	0%			
22	23	0%	0%	0%	0%	0%	0%	0%			
23	24	0%	0%	0%	0%	0%	0%	0%			

McK8760 - Lighting Schedules

O1 Provide Decentralized Boiler



Baseline Lighting Load Profiles (Percent of Peak Lighting Load)

	Baseline - A - Weekly Schedule										
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat			
From	То	1	2	3	4	5	6	7			
0	1	20%	20%	20%	20%	20%	20%	20%			
1	2	20%	20%	20%	20%	20%	20%	20%			
2	3	20%	20%	20%	20%	20%	20%	20%			
3	4	20%	20%	20%	20%	20%	20%	20%			
4	5	20%	20%	20%	20%	20%	20%	20%			
5	6	20%	20%	20%	20%	20%	20%	20%			
6	7	20%	20%	20%	20%	20%	20%	20%			
7	8	20%	30%	30%	30%	30%	30%	20%			
8	9	85%	85%	85%	85%	85%	85%	85%			
9	10	95%	95%	95%	95%	95%	95%	95%			
10	11	95%	95%	95%	95%	95%	95%	95%			
11	12	95%	95%	95%	95%	95%	95%	95%			
12	13	80%	80%	80%	80%	80%	80%	80%			
13	14	80%	80%	80%	80%	80%	80%	80%			
14	15	80%	80%	80%	80%	80%	80%	80%			
15	16	70%	70%	70%	70%	70%	70%	70%			
16	17	50%	50%	50%	50%	50%	50%	50%			
17	18	50%	50%	50%	50%	50%	50%	50%			
18	19	35%	35%	35%	35%	35%	35%	35%			
19	20	35%	35%	35%	35%	35%	35%	35%			
20	21	35%	35%	35%	35%	35%	35%	35%			
21	22	30%	30%	30%	30%	30%	30%	30%			
22	23	20%	20%	20%	20%	20%	20%	20%			
23	24	20%	20%	20%	20%	20%	20%	20%			

Baseline - B - Not Applicable										
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То							7		
0	1	5%	5%	5%	5%	5%	5%	5%		
1	2	5%	5%	5%	5%	5%	5%	5%		
2	3	5%	5%	5%	5%	5%	5%	5%		
3	4	5%	5%	5%	5%	5%	5%	5%		
4	5	5%	5%	5%	5%	5%	5%	5%		
5	6	5%	5%	5%	5%	5%	5%	5%		
6	7	5%	5%	5%	5%	5%	5%	5%		
7	8	5%	15%	15%	15%	15%	15%	5%		
8	9	5%	45%	45%	45%	45%	45%	5%		
9	10	5%	50%	50%	50%	50%	50%	5%		
10	11	5%	50%	50%	50%	50%	50%	5%		
11	12	5%	50%	50%	50%	50%	50%	5%		
12	13	5%	45%	45%	45%	45%	45%	5%		
13	14	5%	45%	45%	45%	45%	45%	5%		
14	15	5%	45%	45%	45%	45%	45%	5%		
15	16	5%	25%	25%	25%	25%	25%	5%		
16	17	5%	15%	15%	15%	15%	15%	5%		
17	18	5%	15%	15%	15%	15%	15%	5%		
18	19	5%	15%	15%	15%	15%	15%	5%		
19	20	5%	15%	15%	15%	15%	15%	5%		
20	21	5%	15%	15%	15%	15%	15%	5%		
21	22	5%	15%	15%	15%	15%	15%	5%		
22	23	5%	5%	5%	5%	5%	5%	5%		
23	24	5%	5%	5%	5%	5%	5%	5%		

Baseline - C - Not Applicable										
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То	1	2	3	4	5	6	7		
0	1	5%	5%	5%	5%	5%	5%	5%		
1	2	5%	5%	5%	5%	5%	5%	5%		
2	3	5%	5%	5%	5%	5%	5%	5%		
3	4	5%	5%	5%	5%	5%	5%	5%		
4	5	5%	5%	5%	5%	5%	5%	5%		
5	6	5%	5%	5%	5%	5%	5%	5%		
6	7	5%	5%	5%	5%	5%	5%	5%		
7	8	5%	10%	10%	10%	10%	10%	5%		
8	9	5%	15%	15%	15%	15%	15%	5%		
9	10	5%	25%	25%	25%	25%	25%	5%		
10	11	5%	25%	25%	25%	25%	25%	5%		
11	12	5%	25%	25%	25%	25%	25%	5%		
12	13	5%	25%	25%	25%	25%	25%	5%		
13	14	5%	25%	25%	25%	25%	25%	5%		
14	15	5%	25%	25%	25%	25%	25%	5%		
15	16	5%	15%	15%	15%	15%	15%	5%		
16	17	5%	10%	10%	10%	10%	10%	5%		
17	18	5%	5%	5%	5%	5%	5%	5%		
18	19	5%	5%	5%	5%	5%	5%	5%		
19	20	5%	5%	5%	5%	5%	5%	5%		
20	21	5%	5%	5%	5%	5%	5%	5%		
21	22	5%	5%	5%	5%	5%	5%	5%		
22	23	5%	5%	5%	5%	5%	5%	5%		
23	24	5%	5%	5%	5%	5%	5%	5%		

Proposed Lighting Load Profiles (Percent of Peak Lighting Load)

		Prop	osed - /	A - Wee	kly Sche	dule		
Н	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То	1	2	3	4	5	6	7
0	1	20%	20%	20%	20%	20%	20%	20%
1	2	20%	20%	20%	20%	20%	20%	20%
2	3	20%	20%	20%	20%	20%	20%	20%
3	4	20%	20%	20%	20%	20%	20%	20%
4	5	20%	20%	20%	20%	20%	20%	20%
5	6	20%	20%	20%	20%	20%	20%	20%
6	7	20%	20%	20%	20%	20%	20%	20%
7	8	20%	30%	30%	30%	30%	30%	20%
8	9	85%	85%	85%	85%	85%	85%	85%
9	10	95%	95%	95%	95%	95%	95%	95%
10	11	95%	95%	95%	95%	95%	95%	95%
11	12	95%	95%	95%	95%	95%	95%	95%
12	13	80%	80%	80%	80%	80%	80%	80%
13	14	80%	80%	80%	80%	80%	80%	80%
14	15	80%	80%	80%	80%	80%	80%	80%
15	16	70%	70%	70%	70%	70%	70%	70%
16	17	50%	50%	50%	50%	50%	50%	50%
17	18	50%	50%	50%	50%	50%	50%	50%
18	19	35%	35%	35%	35%	35%	35%	35%
19	20	35%	35%	35%	35%	35%	35%	35%
20	21	35%	35%	35%	35%	35%	35%	35%
21	22	30%	30%	30%	30%	30%	30%	30%
22	23	20%	20%	20%	20%	20%	20%	20%
23	24	20%	20%	20%	20%	20%	20%	20%

	Proposed - B - Not Applicable										
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat			
From	То	1	2	3	4	5	6	7			
0	1	5%	5%	5%	5%	5%	5%	5%			
1	2	5%	5%	5%	5%	5%	5%	5%			
2	3	5%	5%	5%	5%	5%	5%	5%			
3	4	5%	5%	5%	5%	5%	5%	5%			
4	5	5%	5%	5%	5%	5%	5%	5%			
5	6	5%	5%	5%	5%	5%	5%	5%			
6	7	5%	5%	5%	5%	5%	5%	5%			
7	8	5%	15%	15%	15%	15%	15%	5%			
8	9	5%	45%	45%	45%	45%	45%	5%			
9	10	5%	50%	50%	50%	50%	50%	5%			
10	11	5%	50%	50%	50%	50%	50%	5%			
11	12	5%	50%	50%	50%	50%	50%	5%			
12	13	5%	45%	45%	45%	45%	45%	5%			
13	14	5%	45%	45%	45%	45%	45%	5%			
14	15	5%	45%	45%	45%	45%	45%	5%			
15	16	5%	25%	25%	25%	25%	25%	5%			
16	17	5%	15%	15%	15%	15%	15%	5%			
17	18	5%	15%	15%	15%	15%	15%	5%			
18	19	5%	15%	15%	15%	15%	15%	5%			
19	20	5%	15%	15%	15%	15%	15%	5%			
20	21	5%	15%	15%	15%	15%	15%	5%			
21	22	5%	15%	15%	15%	15%	15%	5%			
22	23	5%	5%	5%	5%	5%	5%	5%			
23	24	5%	5%	5%	5%	5%	5%	5%			

	Proposed - C - Not Applicable									
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	To	1	2	3	4	5	6	7		
0	1	5%	5%	5%	5%	5%	5%	5%		
1	2	5%	5%	5%	5%	5%	5%	5%		
2	3	5%	5%	5%	5%	5%	5%	5%		
3	4	5%	5%	5%	5%	5%	5%	5%		
4	5	5%	5%	5%	5%	5%	5%	5%		
5	6	5%	5%	5%	5%	5%	5%	5%		
6	7	5%	5%	5%	5%	5%	5%	5%		
7	8	5%	10%	10%	10%	10%	10%	5%		
8	9	5%	15%	15%	15%	15%	15%	5%		
9	10	5%	25%	25%	25%	25%	25%	5%		
10	11	5%	25%	25%	25%	25%	25%	5%		
11	12	5%	25%	25%	25%	25%	25%	5%		
12	13	5%	25%	25%	25%	25%	25%	5%		
13	14	5%	25%	25%	25%	25%	25%	5%		
14	15	5%	25%	25%	25%	25%	25%	5%		
15	16	5%	15%	15%	15%	15%	15%	5%		
16	17	5%	10%	10%	10%	10%	10%	5%		
17	18	5%	5%	5%	5%	5%	5%	5%		
18	19	5%	5%	5%	5%	5%	5%	5%		
19	20	5%	5%	5%	5%	5%	5%	5%		
20	21	5%	5%	5%	5%	5%	5%	5%		
21	22	5%	5%	5%	5%	5%	5%	5%		
22	23	5%	5%	5%	5%	5%	5%	5%		
23	24	5%	5%	5%	5%	5%	5%	5%		

McK8760 - Plug Load Schedules

O1 Provide Decentralized Boiler



Baseline Plug Load Profiles (Percent of Peak Plug Load)

Baseline - A - Weekly Schedule									
Ho	ur	Sun	Mon	Tue	Wed	Thu	Fri	Sat	
From	То	1	2	3	4	5	6		
0	1	50%	50%	50%	50%	50%	50%	50%	
1	2	50%	50%	50%	50%	50%	50%	50%	
2	3	50%	50%	50%	50%	50%	50%	50%	
3	4	50%	50%	50%	50%	50%	50%	50%	
4	5	50%	50%	50%	50%	50%	50%	50%	
5	6	50%	50%	50%	50%	50%	50%	50%	
6	7	50%	50%	50%	50%	50%	50%	50%	
7	8	50%	50%	50%	50%	50%	50%	50%	
8	9	85%	85%	85%	85%	85%	85%	85%	
9	10	95%	95%	95%	95%	95%	95%	95%	
10	11	95%	95%	95%	95%	95%	95%	95%	
11	12	95%	95%	95%	95%	95%	95%	95%	
12	13	80%	80%	80%	80%	80%	80%	80%	
13	14	80%	80%	80%	80%	80%	80%	80%	
14	15	80%	80%	80%	80%	80%	80%	80%	
15	16	70%	70%	70%	70%	70%	70%	70%	
16	17	50%	50%	50%	50%	50%	50%	50%	
17	18	50%	50%	50%	50%	50%	50%	50%	
18	19	50%	50%	50%	50%	50%	50%	50%	
19	20	50%	50%	50%	50%	50%	50%	50%	
20	21	50%	50%	50%	50%	50%	50%	50%	
21	22	50%	50%	50%	50%	50%	50%	50%	
22	23	50%	50%	50%	50%	50%	50%	50%	
23	24	50%	50%	50%	50%	50%	50%	50%	

	Baseline - B - Not Applicable										
Hour		Sun	Mon	Tue	Wed	Thu	Fri	Sat			
From	То										
0	1	5%	5%	5%	5%	5%	5%	5%			
1	2	5%	5%	5%	5%	5%	5%	5%			
2	3	5%	5%	5%	5%	5%	5%	5%			
3	4	5%	5%	5%	5%	5%	5%	5%			
4	5	5%	5%	5%	5%	5%	5%	5%			
5	6	5%	5%	5%	5%	5%	5%	5%			
6	7	5%	5%	5%	5%	5%	5%	5%			
7	8	5%	15%	15%	15%	15%	15%	5%			
8	9	5%	45%	45%	45%	45%	45%	5%			
9	10	5%	50%	50%	50%	50%	50%	5%			
10	11	5%	50%	50%	50%	50%	50%	5%			
11	12	5%	50%	50%	50%	50%	50%	5%			
12	13	5%	45%	45%	45%	45%	45%	5%			
13	14	5%	45%	45%	45%	45%	45%	5%			
14	15	5%	45%	45%	45%	45%	45%	5%			
15	16	5%	25%	25%	25%	25%	25%	5%			
16	17	5%	10%	10%	10%	10%	10%	5%			
17	18	5%	5%	5%	5%	5%	5%	5%			
18	19	5%	5%	5%	5%	5%	5%	5%			
19	20	5%	5%	5%	5%	5%	5%	5%			
20	21	5%	5%	5%	5%	5%	5%	5%			
21	22	5%	5%	5%	5%	5%	5%	5%			
22	23	5%	5%	5%	5%	5%	5%	5%			
23	24	5%	5%	5%	5%	5%	5%	5%			

	Baseline - C - Not Applicable										
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat			
From	То	1	2	3	4	5	6	7			
0	1	5%	5%	5%	5%	5%	5%	5%			
1	2	5%	5%	5%	5%	5%	5%	5%			
2	3	5%	5%	5%	5%	5%	5%	5%			
3	4	5%	5%	5%	5%	5%	5%	5%			
4	5	5%	5%	5%	5%	5%	5%	5%			
5	6	5%	5%	5%	5%	5%	5%	5%			
6	7	5%	5%	5%	5%	5%	5%	5%			
7	8	5%	10%	10%	10%	10%	10%	5%			
8	9	5%	15%	15%	15%	15%	15%	5%			
9	10	5%	15%	15%	15%	15%	15%	5%			
10	11	5%	15%	15%	15%	15%	15%	5%			
11	12	5%	15%	15%	15%	15%	15%	5%			
12	13	5%	15%	15%	15%	15%	15%	5%			
13	14	5%	15%	15%	15%	15%	15%	5%			
14	15	5%	15%	15%	15%	15%	15%	5%			
15	16	5%	15%	15%	15%	15%	15%	5%			
16	17	5%	10%	10%	10%	10%	10%	5%			
17	18	5%	5%	5%	5%	5%	5%	5%			
18	19	5%	5%	5%	5%	5%	5%	5%			
19	20	5%	5%	5%	5%	5%	5%	5%			
20	21	5%	5%	5%	5%	5%	5%	5%			
21	22	5%	5%	5%	5%	5%	5%	5%			
22	23	5%	5%	5%	5%	5%	5%	5%			
23	24	5%	5%	5%	5%	5%	5%	5%			

Proposed Plug Load Profiles (Percent of Peak Plug Load)

	,,,,,,	9		J			••••	
		Prop	osed - i	A - Wee	kly Sche	dule		
Hour		Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То	1	2	3	4	5	6	7
0	1	50%	50%	50%	50%	50%	50%	50%
1	2	50%	50%	50%	50%	50%	50%	50%
2	3	50%	50%	50%	50%	50%	50%	50%
3	4	50%	50%	50%	50%	50%	50%	50%
4	5	50%	50%	50%	50%	50%	50%	50%
5	6	50%	50%	50%	50%	50%	50%	50%
6	7	50%	50%	50%	50%	50%	50%	50%
7	8	50%	50%	50%	50%	50%	50%	50%
8	9	85%	85%	85%	85%	85%	85%	85%
9	10	95%	95%	95%	95%	95%	95%	95%
10	11	95%	95%	95%	95%	95%	95%	95%
11	12	95%	95%	95%	95%	95%	95%	95%
12	13	80%	80%	80%	80%	80%	80%	80%
13	14	80%	80%	80%	80%	80%	80%	80%
14	15	80%	80%	80%	80%	80%	80%	80%
15	16	70%	70%	70%	70%	70%	70%	70%
16	17	50%	50%	50%	50%	50%	50%	50%
17	18	50%	50%	50%	50%	50%	50%	50%
18	19	50%	50%	50%	50%	50%	50%	50%
19	20	50%	50%	50%	50%	50%	50%	50%
20	21	50%	50%	50%	50%	50%	50%	50%
21	22	50%	50%	50%	50%	50%	50%	50%
22	23	50%	50%	50%	50%	50%	50%	50%
23	24	50%	50%	50%	50%	50%	50%	50%

	Proposed - B - Not Applicable											
Нс	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat				
From	То	1	2	3	4	5	6	7				
0	1	5%	5%	5%	5%	5%	5%	5%				
1	2	5%	5%	5%	5%	5%	5%	5%				
2	3	5%	5%	5%	5%	5%	5%	5%				
3	4	5%	5%	5%	5%	5%	5%	5%				
4	5	5%	5%	5%	5%	5%	5%	5%				
5	6	5%	5%	5%	5%	5%	5%	5%				
6	7	5%	5%	5%	5%	5%	5%	5%				
7	8	5%	15%	15%	15%	15%	15%	5%				
8	9	5%	45%	45%	45%	45%	45%	5%				
9	10	5%	50%	50%	50%	50%	50%	5%				
10	11	5%	50%	50%	50%	50%	50%	5%				
11	12	5%	50%	50%	50%	50%	50%	5%				
12	13	5%	45%	45%	45%	45%	45%	5%				
13	14	5%	45%	45%	45%	45%	45%	5%				
14	15	5%	45%	45%	45%	45%	45%	5%				
15	16	5%	25%	25%	25%	25%	25%	5%				
16	17	5%	10%	10%	10%	10%	10%	5%				
17	18	5%	5%	5%	5%	5%	5%	5%				
18	19	5%	5%	5%	5%	5%	5%	5%				
19	20	5%	5%	5%	5%	5%	5%	5%				
20	21	5%	5%	5%	5%	5%	5%	5%				
21	22	5%	5%	5%	5%	5%	5%	5%				
22	23	5%	5%	5%	5%	5%	5%	5%				
23	24	5%	5%	5%	5%	5%	5%	5%				

	Proposed - C - Not Applicable												
		Sun		Tue									
From	То	1	2	3	4	5	6	7					
0	1	5%	5%	5%	5%	5%	5%	5%					
1	2	5%	5%	5%	5%	5%	5%	5%					
2	3	5%	5%	5%	5%	5%	5%	5%					
3	4	5%	5%	5%	5%	5%	5%	5%					
4	5	5%	5%	5%	5%	5%	5%	5%					
5	6	5%	5%	5%	5%	5%	5%	5%					
6	7	5%	5%	5%	5%	5%	5%	5%					
7	8	5%	10%	10%	10%	10%	10%	5%					
8	9	5%	15%	15%	15%	15%	15%	5%					
9	10	5%	15%	15%	15%	15%	15%	5%					
10	11	5%	15%	15%	15%	15%	15%	5%					
11	12	5%	15%	15%	15%	15%	15%	5%					
12	13	5%	15%	15%	15%	15%	15%	5%					
13	14	5%	15%	15%	15%	15%	15%	5%					
14	15	5%	15%	15%	15%	15%	15%	5%					
15	16	5%	15%	15%	15%	15%	15%	5%					
16	17	5%	10%	10%	10%	10%	10%	5%					
17	18	5%	5%	5%	5%	5%	5%	5%					
18	19	5%	5%	5%	5%	5%	5%	5%					
19	20	5%	5%	5%	5%	5%	5%	5%					
20	21	5%	5%	5%	5%	5%	5%	5%					
21	22	5%	5%	5%	5%	5%	5%	5%					
22	23	5%	5%	5%	5%	5%	5%	5%					
23	24	5%	5%	5%	5%	5%	5%	5%					

McK8760 - Calendar

O1 Provide Decentralized Boiler



Calendar

Weekends Highlighted Yellow For Reference Year 1989

Month	1	2	3	4	5	6	7	8	9	10	11	12
Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
2	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
3	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
4	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
5	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
6	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
7	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
8	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
9	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
10	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
11	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
12	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
13	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
14	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
15	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
16	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
17	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
18	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
19	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
20	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
21	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
22	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
23	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
24	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
25	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
26	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
27	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
28	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
29	Α		Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
30	Α		Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
31	Α		Α		Α		Α	Α		Α		Α

Holidays and Observances: (Reference Year 1989)

Jan 1	New Year's Day	May 29	Memorial Day	Oct 31	Halloween
Jan 16	MLK Day	Jul 4	Independence Day	Nov 11	Veterans Day
Feb 20	Presidents' Day	Sep 4	Labor Day	Nov 23	Thanksgiving Day
Mar 26	Easter Sunday	Oct 9	Columbus Day	Dec 25	Christmas Day

Schedules Summary

Scenario	Scenario Title	Total Days/Yr	Total Hrs/Yr	Baseline HVAC On Hrs/Yr	Proposed HVAC On Hrs/Yr
Schedule A	Weekly Schedule	365	8,760	8,760	8,760
Schedule B	Not Applicable	0	0	0	0
Schedule C	Not Applicable	0	0	0	0
-		365	8,760	8,760	8,760

McK8760 - Inputs

O1 Provide Decentralized Boiler



Zone Inputs:

Tag	Variable Description	Units	Baseline	Proposed	Basis	
17	Floor Area		ft ²	21,400	21,400	
18	Roof Area	ft ²	7,183	7,183		
I9	Opaque Wall Area		ft ²	7,027	7,027	
I10	Glazing Area	Glazing	ft ²	1,757	1,757	
I12	Roof U-Factor	Roof	BTU/ft ² /°F	0.200	0.200	
I13	Opaque Wall U-Factor	Walls	BTU/ft ² /°F	0.140	0.140	
I14	Glazing U-Factor	Glazing	BTU/ft ² /°F	1.100	1.100	
I15	Glazing Shading Heat Gain Coefficient	Glazing	-	1.000	1.000	
I16	Glazing Solar Gain Bldg Shape Factor		-	0.300	0.300	
I17	Average Space Height (Floor to Ceiling)		ft	9.0	9.0	
I18	Infiltration	ach	0.250	0.250		
I19	Peak Number of Occupants		Qty	20	20	
I20	Sensible Heat Gain Per Person		Btu/h	250	250	
I21	Latent Heat Gain Per Person		Btu/h	200	200	
I22	Peak Lighting Load Power Density		W/ft ²	1.200	1.200	
I23	Peak Plug Load Power Density		W/ft ²	0.300	0.300	
I24	Peak Miscellaneous Load (Electrical)		Watt	0	0	
I25	Miscellaneous Load Located in Conditioned Space		Yes/No	No	No	
I26	HVAC On Cooling Space Temperature Set Point		°F	74.0	74.0	
I27	HVAC Off Cooling Space Temperature Set Point	°F	74.0	74.0		
I28	HVAC On Heating Space Temperature Set Point	°F	72.0	72.0		
I29	HVAC Off Heating Space Temperature Set Point		°F	72.0	72.0	

AHU & Plant Inputs:

Tag	Variable Description	Units	Baseline	Proposed	Basis	
I33	AHU Fan Power based on Control Type		Туре	CV	CV	
I34	Maximum AHU CFM		CFM	17,300	17,300	
I35	Minimum AHU CFM (% of Maximum CFM)		%	100.0%	100.0%	
I36	Maximum % Outside Air (Economizer % OSA)		%	100.0%	100.0%	
I37	Minimum % Outside Air (Occupied)		%	34.2%	34.2%	
I38	Minimum % Outside Air (Unoccupied)		%	3.0%	3.0%	
I39	Economizer High Limit Set Point		°F	65.0	65.0	
I40	Demand Controlled Ventilation (For Outside Air Contro	l)	Yes/No	No	No	
I41	DCV Airflow Per Person (Based on Space Type)	DCV Tab	CFM/Per	10.00	10.00	
I42	DCV Airflow Per Area (Based on Space Type)	CFM/ft ²	0.09	0.09		
I43	AHU Fan TSP (At Max CFM)			1.500	1.500	
I44	Fan Efficiency		%	60.0%	60.0%	
I45	Supply Air Temperature @ OAT>	81.0	°F	65	65	
I46	Supply Air Temperature @ OAT>	41.0	°F	75	75	
I47	AHU Cooling Efficiency (EER)		BTU/Watt	10.1	10.1	
I48	Evaporative Cooling Effectiveness		%	0.0%	0.0%	
I49	AHU Cooling Lockout Below	°F	50.0	50.0		
150	AHU Heating Efficiency or COP @ OAT>	28.0	COP	0.62	0.88	
I51	AHU Heating Efficiency or COP @ OAT> 27.0			0.62	0.88	
I52	2 AHU Heating Energy Source			Natural Gas	Natural Gas	
153	AHU Heating Lockout Above			75.0	75.0	
I54	Heat Recovery % Effectiveness		%	0.0%	0.0%	

Terminal Devices Inputs (Reheat Coils, VAV Boxes, Baseboard Heaters, etc)

Tag	Variable Description	Units	Baseline	Proposed	Basis	
I58	Terminal Devices		Yes/No	Yes	Yes	
I59	Zone Heating Efficiency or COP @ OAT>	60.0	COP	0.62	0.88	
I60	Zone Heating Efficiency or COP @ OAT>	50.0	COP	0.62	0.88	
I61	Heating Energy Source Zone		Туре	Natural Gas	Natural Gas	
I62	Unoccupied Heating Done By		Zone, AHU	Zone Coil	Zone Coil	
I63	SFPMB Terminal Unit Power		W/CFM	0.00	0.00	

Domestic Hot Water Inputs:

Tag	Variable Description	Units	Baseline	Proposed	Basis
I67	DHW Fuel Type	Type	Natural Gas	Natural Gas	
I68	Energy Factor	-	0.82	0.82	
I69	Working Days Per Year (Used Only For DHW Calc)	Qty	180	180	
I70	Average Daily Hot Water Consumption Per Person	Gallons	1.0	1.0	
I71	Average Entering Cold Water Temperature	°F	50.0	50.0	
I72	Supply Hot Water Temperature	°F	120.0	120.0	

McK8760 - Outputs

O1 Provide Decentralized Boiler



Electric Demand

Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
07	Cooling Peak kW (Month = 7)	kW	32	-	32	-	0	-
08	AHU Heating Peak kW (Month = 3)	kW	0	-	0	-	0	-
09	Zone Heating Peak kW (Month = 1)	kW	0	-	0	-	0	-
010	Fan Peak kW	kW	5	-	5	-	0	-
011	Lights Peak kW	kW	24	-	24	-	0	-
012	Plug Load Peak kW	kW	6	-	6	-	0	-
013	Miscellaneous Load Peak kW	kW	0		0	-	0	-
014	Other Peak kW	kW	0	-	0	-	0	-
015	Peak kW (Month = 7)	kW	62	-	62	-	0	-
016	Peak kW (Sum 12 Monthly Peaks)	kW	549	-	549	-	0	-

Electricity

Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
020	Cooling	kWh/Yr	13,236	2.11	13,236	2.11	0	0.00
021	AHU Heating	kWh/Yr	0	0.00	0	0.00	0	0.00
022	Zone Heating	kWh/Yr	0	0.00	0	0.00	0	0.00
023	AHU Fans	kWh/Yr	44,552	7.11	44,552	7.11	0	0.00
024	Zone Fans	kWh/Yr	0	0.00	0	0.00	0	0.00
025	Lights	kWh/Yr	105,197	16.78	105,197	16.78	0	0.00
026	Plug Loads	kWh/Yr	34,681	5.53	34,681	5.53	0	0.00
027	Miscellaneous Loads	kWh/Yr	0	0.00	0	0.00	0	0.00
028	Domestic Hot Water	kWh/Yr	0	0.00	0	0.00	0	0.00
029	Other Electricity	kWh/Yr	0	0.00	0	0.00	0	0.00
030	Total	kWh/Yr	197,665	31.52	197,665	31.52	0	0.00

Natural Gas

Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
034	AHU Heating	Therm/Yr	19,861	92.81	14,015	65.49	5,845	27.31
035	Zone Heating	Therm/Yr	6,703	31.32	4,730	22.10	1,973	9.22
036	Domestic Hot Water	Therm/Yr	26	0.12	26	0.12	0	0.00
037	Other Natural Gas	Therm/Yr	0	0.00	0	0.00	0	0.00
038	Total	Therm/Yr	26,589	124.25	18,771	87.71	7,818	36.53

Steam

Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
042	AHU Heating	kLB/Yr	0	0.00	0	0.00	0	0.00
043	Zone Heating	kLB/Yr	0	0.00	0	0.00	0	0.00
044	Domestic Hot Water	kLB/Yr	0	0.00	0	0.00	0	0.00
045	Other Steam	kLB/Yr	0	0.00	0	0.00	0	0.00
046	Total Steam	kLB/Yr	0	0.00	0	0.00	0	0.00

Total Energy

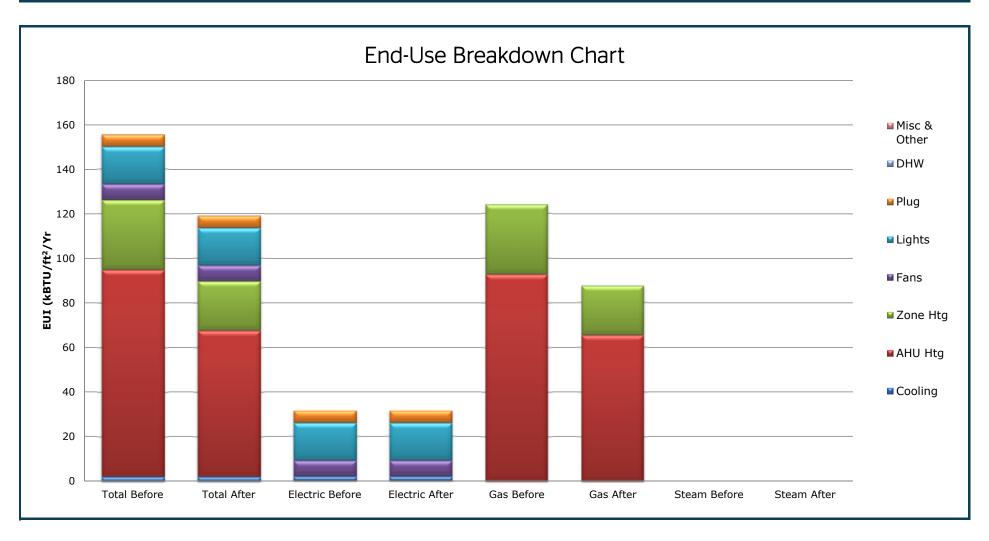
Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
050	Total Energy	kBtu/Yr	3,333,514	155.77	2,551,707	119.24	781,807	36.53

McK8760 - End-Use Breakdown

O1 Provide Decentralized Boiler



EUI By Category	Cooling	AHU Htg	Zone Htg	Fans	Lights	Plug	DHW	Misc & Other	Total
Total Before	2.11	92.81	31.32	7.11	16.78	5.53	0.12	0.00	155.77
Total After	2.11	65.49	22.10	7.11	16.78	5.53	0.12	0.00	119.24
Electric Before	2.11	0.00	0.00	7.11	16.78	5.53	0.00	0.00	31.52
Electric After	2.11	0.00	0.00	7.11	16.78	5.53	0.00	0.00	31.52
Gas Before	0.00	92.81	31.32	0.00	0.00	0.00	0.12	0.00	124.25
Gas After	0.00	65.49	22.10	0.00	0.00	0.00	0.12	0.00	87.71
Steam Before	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Steam After	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



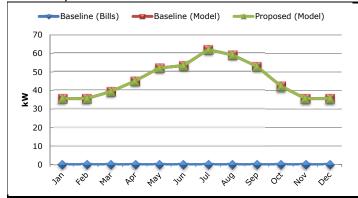
McK8760 - Model Tuning Charts

O1 Provide Decentralized Boiler



#DIV/0!

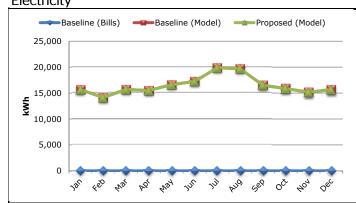
Electricity Demand



Month	Baseline (Bills)	Baseline (Model)	Proposed (Model)					
Jan	0	36	36					
Feb	0	36	36					
Mar	0	39	39					
Apr	0	45	45					
May	0	52	52					
Jun	0	54	54					
Jul	0	62	62					
Aug	0	59	59					
Sep	0	53	53					
Oct	0	42	42					
Nov	0	36	36					
Dec	0	36	36					
Total	0	549	549					
% Delta Between Bas	6 Delta Between Baseline (Bills) & Baseline (Model) 100%							

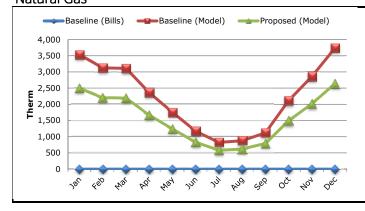
RSQ (Correlation Coefficient)

Electricity



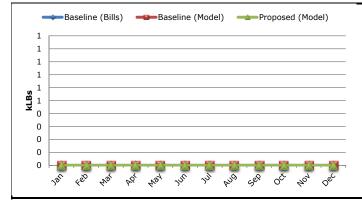
Month	Baseline (Bills)	Baseline (Model)	Proposed (Model)
Jan	0	15,660	15,660
Feb	0	14,147	14,147
Mar	0	15,691	15,691
Apr	0	15,498	15,498
May	0	16,639	16,639
Jun	0	17,237	17,237
Jul	0	19,874	19,874
Aug	0	19,707	19,707
Sep	0	16,504	16,504
Oct	0	15,886	15,886
Nov	0	15,159	15,159
Dec	0	15,665	15,665
Total	0	197,665	197,665
% Delta Between Ba	100%		
RSQ (Correlation Co	#DIV/0!		

Natural Gas



Month	Baseline (Bills)	Baseline (Model)	Proposed (Model)				
Jan	0	3,532	2,493				
Feb	0	3,125	2,206				
Mar	0	3,111	2,196				
Apr	0	2,359	1,665				
May	0	1,754	1,238				
Jun	0	1,170	826				
Jul	0	824	582				
Aug	0	877	619				
Sep	0	1,120	791				
Oct	0	2,115	1,493				
Nov	0	2,859	2,018				
Dec	0	3,743	2,642				
Total	0	26,589	18,771				
% Delta Between Bas	100%						
RSQ (Correlation Coef	RSQ (Correlation Coefficient)						

Steam



Month	Baseline (Bills)	Baseline (Model)	Proposed (Model)
Jan	0	0	0
Feb	0	0	0
Mar	0	0	0
Apr	0	0	0
May	0	0	0
Jun	0	0	0
Jul	0	0	0
Aug	0	0	0
Sep	0	0	0
Oct	0	0	0
Nov	0	0	0
Dec	0	0	0
Total	0	0	0

% Delta Between Baseline (Bills) & Baseline (Model)	#DIV/0!
RSQ (Correlation Coefficient)	#DIV/0!

Facility Improvement Measure (FIM) Detail

Project	WA Governor's Residence
Scenario	FINAL
Date	December 2, 2013



FIM ID 20167 Facility WA Governors	Mansion
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FIM Name 05 Upgrade Single Pane Glazing

FIM Description

The intent of this measure is to provide storm windows installed on the inside face of the existing glazing.

Existing: The existing windows are original to the building. These windows are single pane and have poor thermal and shading performance and air sealing.

Proposed: Provide window inserts to be installed on the inside face of the existing glazing.

Benefits: Energy savings will be realized by reducing solar heat gain, improving the glazing thermal performance, reducing infiltration due to air leakage, and increasing room mean radiant temperature.

Savings Methodology

Annual savings is calculated using a bin calculation calibrated to match the consumption recorded by the steam, electric, and chilled water submeters serving the residence. Baseline glazing performance is based on values expected for single pane glazing. The proposed glazing performance is based on acrylic type window inserts in series with the original single pane glazing. The calculations take into account the heating system efficiency improvements included within the scope of FIM 01 Provide Decentralized Boiler.

Utility Savings			
Utility Type	Utility Unit	Quantity Savings	Dollar Savings
Electricity	kWh	206	\$12
Electric Demand	kW	0	\$0
Natural Gas	Therm	2,108	\$1,201
Water	kgal	0	\$0
Sewer	kgal	0	\$0
Total			\$1,213

Confidential & Proprietary

McK8760 - HVAC Schedules

05 Upgrade Single Pane Glazing



1 = Scheduled ON

Baseline HVAC Equipment Daily Schedules

	Baseline - A - Weekly Schedule							
Н	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То							
0	1	1	1	1	1	1	1	1
1	2	1	1	1	1	1	1	1
2	3	1	1	1	1	1	1	1
3	4	1	1	1	1	1	1	1
4	5	1	1	1	1	1	1	1
5	6	1	1	1	1	1	1	1
6	7	1	1	1	1	1	1	1
7	8	1	1	1	1	1	1	1
8	9	1	1	1	1	1	1	1
9	10	1	1	1	1	1	1	1
10	11	1	1	1	1	1	1	1
11	12	1	1	1	1	1	1	1
12	13	1	1	1	1	1	1	1
13	14	1	1	1	1	1	1	1
14	15	1	1	1	1	1	1	1
15	16	1	1	1	1	1	1	1
16	17	1	1	1	1	1	1	1
17	18	1	1	1	1	1	1	1
18	19	1	1	1	1	1	1	1
19	20	1	1	1	1	1	1	1
20	21	1	1	1	1	1	1	1
21	22	1	1	1	1	1	1	1
22	23	1	1	1	1	1	1	1
23	24	1	1	1	1	1	1	1
Daily	Totals	24	24	24	24	24	24	24

	Baseline - B - Not Applicable							
Н	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То	1	2	3	4	5	6	7
0	1	0	0	0	0	0	0	0
1	2	0	0	0	0	0	0	0
2	3	0	0	0	0	0	0	0
3	4	0	0	0	0	0	0	0
4	5	0	0	0	0	0	0	0
5	6	0	0	0	0	0	0	0
6	7	0	0	0	0	0	0	0
7	8	0	1	1	1	1	1	0
8	9	0	1	1	1	1	1	0
9	10	0	1	1	1	1	1	0
10	11	0	1	1	1	1	1	0
11	12	0	1	1	1	1	1	0
12	13	0	1	1	1	1	1	0
13	14	0	1	1	1	1	1	0
14	15	0	1	1	1	1	1	0
15	16	0	1	1	1	1	1	0
16	17	0	0	0	0	0	0	0
17	18	0	0	0	0	0	0	0
18	19	0	0	0	0	0	0	0
19	20	0	0	0	0	0	0	0
20	21	0	0	0	0	0	0	0
21	22	0	0	0	0	0	0	0
22	23	0	0	0	0	0	0	0
23	24	0	0	0	0	0	0	0
Daily	Totals	0	9	9	9	9	9	0

	Baseline - C - Not Applicable							
Нс	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То	1	2	3	4	5	6	7
0	1	0	0	0	0	0	0	0
1	2	0	0	0	0	0	0	0
2	3	0	0	0	0	0	0	0
3	4	0	0	0	0	0	0	0
4	5	0	0	0	0	0	0	0
5	6	0	0	0	0	0	0	0
6	7	0	0	0	0	0	0	0
7	8	0	0	0	0	0	0	0
8	9	0	0	0	0	0	0	0
9	10	0	1	1	1	1	1	0
10	11	0	1	1	1	1	1	0
11	12	0	1	1	1	1	1	0
12	13	0	1	1	1	1	1	0
13	14	0	1	1	1	1	1	0
14	15	0	1	1	1	1	1	0
15	16	0	0	0	0	0	0	0
16	17	0	0	0	0	0	0	0
17	18	0	0	0	0	0	0	0
18	19	0	0	0	0	0	0	0
19	20	0	0	0	0	0	0	0
20	21	0	0	0	0	0	0	0
21	22	0	0	0	0	0	0	0
22	23	0	0	0	0	0	0	0
23	24	0	0	0	0	0	0	0
Daily	Totals	0	6	6	6	6	6	0

0 = Schedule OFF

Proposed HVAC Equipment Daily Schedules

	Proposed - A - Weekly Schedule								
Н	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat	
From	То	1	2	3	4	5	6	7	
0	1	1	1	1	1	1	1	1	
1	2	1	1	1	1	1	1	1	
2	3	1	1	1	1	1	1	1	
3	4	1	1	1	1	1	1	1	
4	5	1	1	1	1	1	1	1	
5	6	1	1	1	1	1	1	1	
6	7	1	1	1	1	1	1	1	
7	8	1	1	1	1	1	1	1	
8	9	1	1	1	1	1	1	1	
9	10	1	1	1	1	1	1	1	
10	11	1	1	1	1	1	1	1	
11	12	1	1	1	1	1	1	1	
12	13	1	1	1	1	1	1	1	
13	14	1	1	1	1	1	1	1	
14	15	1	1	1	1	1	1	1	
15	16	1	1	1	1	1	1	1	
16	17	1	1	1	1	1	1	1	
17	18	1	1	1	1	1	1	1	
18	19	1	1	1	1	1	1	1	
19	20	1	1	1	1	1	1	1	
20	21	1	1	1	1	1	1	1	
21	22	1	1	1	1	1	1	1	
22	23	1	1	1	1	1	1	1	
23	24	1	1	1	1	1	1	1	
Daily	Totals	24	24	24	24	24	24	24	

	Proposed - B - Not Applicable							
Н	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То							
0	1	0	0	0	0	0	0	0
1	2	0	0	0	0	0	0	0
2	3	0	0	0	0	0	0	0
3	4	0	0	0	0	0	0	0
4	5	0	0	0	0	0	0	0
5	6	0	0	0	0	0	0	0
6	7	0	0	0	0	0	0	0
7	8	0	1	1	1	1	1	0
8	9	0	1	1	1	1	1	0
9	10	0	1	1	1	1	1	0
10	11	0	1	1	1	1	1	0
11	12	0	1	1	1	1	1	0
12	13	0	1	1	1	1	1	0
13	14	0	1	1	1	1	1	0
14	15	0	1	1	1	1	1	0
15	16	0	1	1	1	1	1	0
16	17	0	0	0	0	0	0	0
17	18	0	0	0	0	0	0	0
18	19	0	0	0	0	0	0	0
19	20	0	0	0	0	0	0	0
20	21	0	0	0	0	0	0	0
21	22	0	0	0	0	0	0	0
22	23	0	0	0	0	0	0	0
23	24	0	0	0	0	0	0	0
Daily	Totals	0	9	9	9	9	9	0

0 = Schedule OFF 1 =	Scheduled	I ON
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	Proposed - C - Not Applicable										
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat			
From	То	1	2	3	4	5	6				
0	1	0	0	0	0	0	0	0			
1	2	0	0	0	0	0	0	0			
2	3	0	0	0	0	0	0	0			
3	4	0	0	0	0	0	0	0			
4	5	0	0	0	0	0	0	0			
5	6	0	0	0	0	0	0	0			
6	7	0	0	0	0	0	0	0			
7	8	0	0	0	0	0	0	0			
8	9	0	0	0	0	0	0	0			
9	10	0	1	1	1	1	1	0			
10	11	0	1	1	1	1	1	0			
11	12	0	1	1	1	1	1	0			
12	13	0	1	1	1	1	1	0			
13	14	0	1	1	1	1	1	0			
14	15	0	1	1	1	1	1	0			
15	16	0	0	0	0	0	0	0			
16	17	0	0	0	0	0	0	0			
17	18	0	0	0	0	0	0	0			
18	19	0	0	0	0	0	0	0			
19	20	0	0	0	0	0	0	0			
20	21	0	0	0	0	0	0	0			
21	22	0	0	0	0	0	0	0			
22	23	0	0	0	0	0	0	0			
23	24	0	0	0	0	0	0	0			
Daily	Totals	0	6	6	6	6	6	0			

McK8760 - Occupancy Schedules

O5 Upgrade Single Pane Glazing



Baseline Occupancy Load Profiles (Percent of Peak Occupancy)

			eline - <i>P</i>				10 01 1	
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То	1	2	3	4	5	6	7
0	1	20%	20%	20%	20%	20%	20%	20%
1	2	20%	20%	20%	20%	20%	20%	20%
2	3	20%	20%	20%	20%	20%	20%	20%
3	4	20%	20%	20%	20%	20%	20%	20%
4	5	20%	20%	20%	20%	20%	20%	20%
5	6	20%	20%	20%	20%	20%	20%	20%
6	7	20%	20%	20%	20%	20%	20%	20%
7	8	20%	20%	20%	20%	20%	20%	20%
8	9	20%	20%	20%	20%	20%	20%	20%
9	10	90%	90%	90%	90%	90%	90%	90%
10	11	90%	90%	90%	90%	90%	90%	90%
11	12	80%	80%	80%	80%	80%	80%	80%
12	13	80%	80%	80%	80%	80%	80%	80%
13	14	80%	80%	80%	80%	80%	80%	80%
14	15	80%	80%	80%	80%	80%	80%	80%
15	16	45%	45%	45%	45%	45%	45%	45%
16	17	20%	20%	20%	20%	20%	20%	20%
17	18	20%	20%	20%	20%	20%	20%	20%
18	19	20%	20%	20%	20%	20%	20%	20%
19	20	20%	20%	20%	20%	20%	20%	20%
20	21	20%	20%	20%	20%	20%	20%	20%
21	22	20%	20%	20%	20%	20%	20%	20%
22	23	20%	20%	20%	20%	20%	20%	20%
23	24	20%	20%	20%	20%	20%	20%	20%

Baseline - B - Not Applicable										
Ho	ur	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То	1	2	3	4	5	6			
0	1	0%	0%	0%	0%	0%	0%	0%		
1	2	0%	0%	0%	0%	0%	0%	0%		
2	3	0%	0%	0%	0%	0%	0%	0%		
3	4	0%	0%	0%	0%	0%	0%	0%		
4	5	0%	0%	0%	0%	0%	0%	0%		
5	6	0%	0%	0%	0%	0%	0%	0%		
6	7	0%	0%	0%	0%	0%	0%	0%		
7	8	0%	2%	2%	2%	2%	2%	0%		
8	9	0%	35%	35%	35%	35%	35%	0%		
9	10	0%	45%	45%	45%	45%	45%	0%		
10	11	0%	45%	45%	45%	45%	45%	0%		
11	12	0%	40%	40%	40%	40%	40%	0%		
12	13	0%	40%	40%	40%	40%	40%	0%		
13	14	0%	40%	40%	40%	40%	40%	0%		
14	15	0%	40%	40%	40%	40%	40%	0%		
15	16	0%	25%	25%	25%	25%	25%	0%		
16	17	0%	2%	2%	2%	2%	2%	0%		
17	18	0%	0%	0%	0%	0%	0%	0%		
18	19	0%	0%	0%	0%	0%	0%	0%		
19	20	0%	0%	0%	0%	0%	0%	0%		
20	21	0%	0%	0%	0%	0%	0%	0%		
21	22	0%	0%	0%	0%	0%	0%	0%		
22	23	0%	0%	0%	0%	0%	0%	0%		
23	24	0%	0%	0%	0%	0%	0%	0%		

		Ва	seline -	C - Not	Applical	ole		
Ho	ur	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То	1	2	3	4	5	6	7
0	1	0%	0%	0%	0%	0%	0%	0%
1	2	0%	0%	0%	0%	0%	0%	0%
2	3	0%	0%	0%	0%	0%	0%	0%
3	4	0%	0%	0%	0%	0%	0%	0%
4	5	0%	0%	0%	0%	0%	0%	0%
5	6	0%	0%	0%	0%	0%	0%	0%
6	7	0%	0%	0%	0%	0%	0%	0%
7	8	0%	2%	2%	2%	2%	2%	0%
8	9	0%	5%	5%	5%	5%	5%	0%
9	10	0%	5%	5%	5%	5%	5%	0%
10	11	0%	5%	5%	5%	5%	5%	0%
11	12	0%	5%	5%	5%	5%	5%	0%
12	13	0%	5%	5%	5%	5%	5%	0%
13	14	0%	5%	5%	5%	5%	5%	0%
14	15	0%	5%	5%	5%	5%	5%	0%
15	16	0%	2%	2%	2%	2%	2%	0%
16	17	0%	2%	2%	2%	2%	2%	0%
17	18	0%	0%	0%	0%	0%	0%	0%
18	19	0%	0%	0%	0%	0%	0%	0%
19	20	0%	0%	0%	0%	0%	0%	0%
20	21	0%	0%	0%	0%	0%	0%	0%
21	22	0%	0%	0%	0%	0%	0%	0%
22	23	0%	0%	0%	0%	0%	0%	0%
23	24	0%	0%	0%	0%	0%	0%	0%

Proposed Occupancy Load Profiles (Percent of Peak Occupancy)

			, _					
		Prop	osed - /	4 - Wee	kly Sche	dule		
Н	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То	1	2	3	4	5	6	7
0	1	20%	20%	20%	20%	20%	20%	20%
1	2	20%	20%	20%	20%	20%	20%	20%
2	3	20%	20%	20%	20%	20%	20%	20%
3	4	20%	20%	20%	20%	20%	20%	20%
4	5	20%	20%	20%	20%	20%	20%	20%
5	6	20%	20%	20%	20%	20%	20%	20%
6	7	20%	20%	20%	20%	20%	20%	20%
7	8	20%	20%	20%	20%	20%	20%	20%
8	9	20%	20%	20%	20%	20%	20%	20%
9	10	90%	90%	90%	90%	90%	90%	90%
10	11	90%	90%	90%	90%	90%	90%	90%
11	12	80%	80%	80%	80%	80%	80%	80%
12	13	80%	80%	80%	80%	80%	80%	80%
13	14	80%	80%	80%	80%	80%	80%	80%
14	15	80%	80%	80%	80%	80%	80%	80%
15	16	45%	45%	45%	45%	45%	45%	45%
16	17	20%	20%	20%	20%	20%	20%	20%
17	18	20%	20%	20%	20%	20%	20%	20%
18	19	20%	20%	20%	20%	20%	20%	20%
19	20	20%	20%	20%	20%	20%	20%	20%
20	21	20%	20%	20%	20%	20%	20%	20%
21	22	20%	20%	20%	20%	20%	20%	20%
22	23	20%	20%	20%	20%	20%	20%	20%
23	24	20%	20%	20%	20%	20%	20%	20%

Proposed - B - Not Applicable										
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То	1	2	3	4	5	6	7		
0	1	0%	0%	0%	0%	0%	0%	0%		
1	2	0%	0%	0%	0%	0%	0%	0%		
2	3	0%	0%	0%	0%	0%	0%	0%		
3	4	0%	0%	0%	0%	0%	0%	0%		
4	5	0%	0%	0%	0%	0%	0%	0%		
5	6	0%	0%	0%	0%	0%	0%	0%		
6	7	0%	0%	0%	0%	0%	0%	0%		
7	8	0%	2%	2%	2%	2%	2%	0%		
8	9	0%	35%	35%	35%	35%	35%	0%		
9	10	0%	45%	45%	45%	45%	45%	0%		
10	11	0%	45%	45%	45%	45%	45%	0%		
11	12	0%	40%	40%	40%	40%	40%	0%		
12	13	0%	40%	40%	40%	40%	40%	0%		
13	14	0%	40%	40%	40%	40%	40%	0%		
14	15	0%	40%	40%	40%	40%	40%	0%		
15	16	0%	25%	25%	25%	25%	25%	0%		
16	17	0%	2%	2%	2%	2%	2%	0%		
17	18	0%	0%	0%	0%	0%	0%	0%		
18	19	0%	0%	0%	0%	0%	0%	0%		
19	20	0%	0%	0%	0%	0%	0%	0%		
20	21	0%	0%	0%	0%	0%	0%	0%		
21	22	0%	0%	0%	0%	0%	0%	0%		
22	23	0%	0%	0%	0%	0%	0%	0%		
23	24	0%	0%	0%	0%	0%	0%	0%		

	Proposed - C - Not Applicable									
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То	1	2	3	4	5	6	7		
0	1	0%	0%	0%	0%	0%	0%	0%		
1	2	0%	0%	0%	0%	0%	0%	0%		
2	3	0%	0%	0%	0%	0%	0%	0%		
3	4	0%	0%	0%	0%	0%	0%	0%		
4	5	0%	0%	0%	0%	0%	0%	0%		
5	6	0%	0%	0%	0%	0%	0%	0%		
6	7	0%	0%	0%	0%	0%	0%	0%		
7	8	0%	2%	2%	2%	2%	2%	0%		
8	9	0%	5%	5%	5%	5%	5%	0%		
9	10	0%	5%	5%	5%	5%	5%	0%		
10	11	0%	5%	5%	5%	5%	5%	0%		
11	12	0%	5%	5%	5%	5%	5%	0%		
12	13	0%	5%	5%	5%	5%	5%	0%		
13	14	0%	5%	5%	5%	5%	5%	0%		
14	15	0%	5%	5%	5%	5%	5%	0%		
15	16	0%	2%	2%	2%	2%	2%	0%		
16	17	0%	2%	2%	2%	2%	2%	0%		
17	18	0%	0%	0%	0%	0%	0%	0%		
18	19	0%	0%	0%	0%	0%	0%	0%		
19	20	0%	0%	0%	0%	0%	0%	0%		
20	21	0%	0%	0%	0%	0%	0%	0%		
21	22	0%	0%	0%	0%	0%	0%	0%		
22	23	0%	0%	0%	0%	0%	0%	0%		
23	24	0%	0%	0%	0%	0%	0%	0%		

McK8760 - Lighting Schedules

O5 Upgrade Single Pane Glazing



Baseline Lighting Load Profiles (Percent of Peak Lighting Load)

Dasei	baseline Lighting Load Frontes (Fercent of Feak Lightin									
		Bas	eline - A	A - Week	dy Sche	dule				
Н	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То		2							
0	1	20%	20%	20%	20%	20%	20%	20%		
1	2	20%	20%	20%	20%	20%	20%	20%		
2	3	20%	20%	20%	20%	20%	20%	20%		
3	4	20%	20%	20%	20%	20%	20%	20%		
4	5	20%	20%	20%	20%	20%	20%	20%		
5	6	20%	20%	20%	20%	20%	20%	20%		
6	7	20%	20%	20%	20%	20%	20%	20%		
7	8	20%	30%	30%	30%	30%	30%	20%		
8	9	85%	85%	85%	85%	85%	85%	85%		
9	10	95%	95%	95%	95%	95%	95%	95%		
10	11	95%	95%	95%	95%	95%	95%	95%		
11	12	95%	95%	95%	95%	95%	95%	95%		
12	13	80%	80%	80%	80%	80%	80%	80%		
13	14	80%	80%	80%	80%	80%	80%	80%		
14	15	80%	80%	80%	80%	80%	80%	80%		
15	16	70%	70%	70%	70%	70%	70%	70%		
16	17	50%	50%	50%	50%	50%	50%	50%		
17	18	50%	50%	50%	50%	50%	50%	50%		
18	19	35%	35%	35%	35%	35%	35%	35%		
19	20	35%	35%	35%	35%	35%	35%	35%		
20	21	35%	35%	35%	35%	35%	35%	35%		
21	22	30%	30%	30%	30%	30%	30%	30%		
22	23	20%	20%	20%	20%	20%	20%	20%		
23	24	20%	20%	20%	20%	20%	20%	20%		

Baseline - B - Not Applicable										
Ho	ur	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То	1	2	3	4	5	6	7		
0	1	5%	5%	5%	5%	5%	5%	5%		
1	2	5%	5%	5%	5%	5%	5%	5%		
2	3	5%	5%	5%	5%	5%	5%	5%		
3	4	5%	5%	5%	5%	5%	5%	5%		
4	5	5%	5%	5%	5%	5%	5%	5%		
5	6	5%	5%	5%	5%	5%	5%	5%		
6	7	5%	5%	5%	5%	5%	5%	5%		
7	8	5%	15%	15%	15%	15%	15%	5%		
8	9	5%	45%	45%	45%	45%	45%	5%		
9	10	5%	50%	50%	50%	50%	50%	5%		
10	11	5%	50%	50%	50%	50%	50%	5%		
11	12	5%	50%	50%	50%	50%	50%	5%		
12	13	5%	45%	45%	45%	45%	45%	5%		
13	14	5%	45%	45%	45%	45%	45%	5%		
14	15	5%	45%	45%	45%	45%	45%	5%		
15	16	5%	25%	25%	25%	25%	25%	5%		
16	17	5%	15%	15%	15%	15%	15%	5%		
17	18	5%	15%	15%	15%	15%	15%	5%		
18	19	5%	15%	15%	15%	15%	15%	5%		
19	20	5%	15%	15%	15%	15%	15%	5%		
20	21	5%	15%	15%	15%	15%	15%	5%		
21	22	5%	15%	15%	15%	15%	15%	5%		
22	23	5%	5%	5%	5%	5%	5%	5%		
23	24	5%	5%	5%	5%	5%	5%	5%		

	Baseline - C - Not Applicable										
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat			
From	То	1	2	3	4	5	6	7			
0	1	5%	5%	5%	5%	5%	5%	5%			
1	2	5%	5%	5%	5%	5%	5%	5%			
2	3	5%	5%	5%	5%	5%	5%	5%			
3	4	5%	5%	5%	5%	5%	5%	5%			
4	5	5%	5%	5%	5%	5%	5%	5%			
5	6	5%	5%	5%	5%	5%	5%	5%			
6	7	5%	5%	5%	5%	5%	5%	5%			
7	8	5%	10%	10%	10%	10%	10%	5%			
8	9	5%	15%	15%	15%	15%	15%	5%			
9	10	5%	25%	25%	25%	25%	25%	5%			
10	11	5%	25%	25%	25%	25%	25%	5%			
11	12	5%	25%	25%	25%	25%	25%	5%			
12	13	5%	25%	25%	25%	25%	25%	5%			
13	14	5%	25%	25%	25%	25%	25%	5%			
14	15	5%	25%	25%	25%	25%	25%	5%			
15	16	5%	15%	15%	15%	15%	15%	5%			
16	17	5%	10%	10%	10%	10%	10%	5%			
17	18	5%	5%	5%	5%	5%	5%	5%			
18	19	5%	5%	5%	5%	5%	5%	5%			
19	20	5%	5%	5%	5%	5%	5%	5%			
20	21	5%	5%	5%	5%	5%	5%	5%			
21	22	5%	5%	5%	5%	5%	5%	5%			
22	23	5%	5%	5%	5%	5%	5%	5%			
23	24	5%	5%	5%	5%	5%	5%	5%			

Proposed Lighting Load Profiles (Percent of Peak Lighting Load)

			9					Troposed Eighting Eedd Tromes (Fereent of Fedit Eigh									
		Prop	osed - /	4 - Wee	kly Sche	dule											
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat									
From	То	1	2	3	4	5	6	7									
0	1	20%	20%	20%	20%	20%	20%	20%									
1	2	20%	20%	20%	20%	20%	20%	20%									
2	3	20%	20%	20%	20%	20%	20%	20%									
3	4	20%	20%	20%	20%	20%	20%	20%									
4	5	20%	20%	20%	20%	20%	20%	20%									
5	6	20%	20%	20%	20%	20%	20%	20%									
6	7	20%	20%	20%	20%	20%	20%	20%									
7	8	20%	30%	30%	30%	30%	30%	20%									
8	9	85%	85%	85%	85%	85%	85%	85%									
9	10	95%	95%	95%	95%	95%	95%	95%									
10	11	95%	95%	95%	95%	95%	95%	95%									
11	12	95%	95%	95%	95%	95%	95%	95%									
12	13	80%	80%	80%	80%	80%	80%	80%									
13	14	80%	80%	80%	80%	80%	80%	80%									
14	15	80%	80%	80%	80%	80%	80%	80%									
15	16	70%	70%	70%	70%	70%	70%	70%									
16	17	50%	50%	50%	50%	50%	50%	50%									
17	18	50%	50%	50%	50%	50%	50%	50%									
18	19	35%	35%	35%	35%	35%	35%	35%									
19	20	35%	35%	35%	35%	35%	35%	35%									
20	21	35%	35%	35%	35%	35%	35%	35%									
21	22	30%	30%	30%	30%	30%	30%	30%									
22	23	20%	20%	20%	20%	20%	20%	20%									
23	24	20%	20%	20%	20%	20%	20%	20%									

Proposed - B - Not Applicable										
Ho	ur	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То	1	2	3	4	5	6	7		
0	1	5%	5%	5%	5%	5%	5%	5%		
1	2	5%	5%	5%	5%	5%	5%	5%		
2	3	5%	5%	5%	5%	5%	5%	5%		
3	4	5%	5%	5%	5%	5%	5%	5%		
4	5	5%	5%	5%	5%	5%	5%	5%		
5	6	5%	5%	5%	5%	5%	5%	5%		
6	7	5%	5%	5%	5%	5%	5%	5%		
7	8	5%	15%	15%	15%	15%	15%	5%		
8	9	5%	45%	45%	45%	45%	45%	5%		
9	10	5%	50%	50%	50%	50%	50%	5%		
10	11	5%	50%	50%	50%	50%	50%	5%		
11	12	5%	50%	50%	50%	50%	50%	5%		
12	13	5%	45%	45%	45%	45%	45%	5%		
13	14	5%	45%	45%	45%	45%	45%	5%		
14	15	5%	45%	45%	45%	45%	45%	5%		
15	16	5%	25%	25%	25%	25%	25%	5%		
16	17	5%	15%	15%	15%	15%	15%	5%		
17	18	5%	15%	15%	15%	15%	15%	5%		
18	19	5%	15%	15%	15%	15%	15%	5%		
19	20	5%	15%	15%	15%	15%	15%	5%		
20	21	5%	15%	15%	15%	15%	15%	5%		
21	22	5%	15%	15%	15%	15%	15%	5%		
22	23	5%	5%	5%	5%	5%	5%	5%		
23	24	5%	5%	5%	5%	5%	5%	5%		

	Proposed - C - Not Applicable									
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То	1	2	3	4	5	6	7		
0	1	5%	5%	5%	5%	5%	5%	5%		
1	2	5%	5%	5%	5%	5%	5%	5%		
2	3	5%	5%	5%	5%	5%	5%	5%		
3	4	5%	5%	5%	5%	5%	5%	5%		
4	5	5%	5%	5%	5%	5%	5%	5%		
5	6	5%	5%	5%	5%	5%	5%	5%		
6	7	5%	5%	5%	5%	5%	5%	5%		
7	8	5%	10%	10%	10%	10%	10%	5%		
8	9	5%	15%	15%	15%	15%	15%	5%		
9	10	5%	25%	25%	25%	25%	25%	5%		
10	11	5%	25%	25%	25%	25%	25%	5%		
11	12	5%	25%	25%	25%	25%	25%	5%		
12	13	5%	25%	25%	25%	25%	25%	5%		
13	14	5%	25%	25%	25%	25%	25%	5%		
14	15	5%	25%	25%	25%	25%	25%	5%		
15	16	5%	15%	15%	15%	15%	15%	5%		
16	17	5%	10%	10%	10%	10%	10%	5%		
17	18	5%	5%	5%	5%	5%	5%	5%		
18	19	5%	5%	5%	5%	5%	5%	5%		
19	20	5%	5%	5%	5%	5%	5%	5%		
20	21	5%	5%	5%	5%	5%	5%	5%		
21	22	5%	5%	5%	5%	5%	5%	5%		
22	23	5%	5%	5%	5%	5%	5%	5%		
23	24	5%	5%	5%	5%	5%	5%	5%		

McK8760 - Plug Load Schedules

05 Upgrade Single Pane Glazing



Baseline Plug Load Profiles (Percent of Peak Plug Load)

Baseline - A - Weekly Schedule									
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat	
From	То	1	2	3	4	5	6	7	
0	1	50%	50%	50%	50%	50%	50%	50%	
1	2	50%	50%	50%	50%	50%	50%	50%	
2	3	50%	50%	50%	50%	50%	50%	50%	
3	4	50%	50%	50%	50%	50%	50%	50%	
4	5	50%	50%	50%	50%	50%	50%	50%	
5	6	50%	50%	50%	50%	50%	50%	50%	
6	7	50%	50%	50%	50%	50%	50%	50%	
7	8	50%	50%	50%	50%	50%	50%	50%	
8	9	85%	85%	85%	85%	85%	85%	85%	
9	10	95%	95%	95%	95%	95%	95%	95%	
10	11	95%	95%	95%	95%	95%	95%	95%	
11	12	95%	95%	95%	95%	95%	95%	95%	
12	13	80%	80%	80%	80%	80%	80%	80%	
13	14	80%	80%	80%	80%	80%	80%	80%	
14	15	80%	80%	80%	80%	80%	80%	80%	
15	16	70%	70%	70%	70%	70%	70%	70%	
16	17	50%	50%	50%	50%	50%	50%	50%	
17	18	50%	50%	50%	50%	50%	50%	50%	
18	19	50%	50%	50%	50%	50%	50%	50%	
19	20	50%	50%	50%	50%	50%	50%	50%	
20	21	50%	50%	50%	50%	50%	50%	50%	
21	22	50%	50%	50%	50%	50%	50%	50%	
22	23	50%	50%	50%	50%	50%	50%	50%	
23	24	50%	50%	50%	50%	50%	50%	50%	

Baseline - B - Not Applicable									
Hour		Sun	Mon	Tue	Wed	Thu	Fri	Sat	
From	То	1	2	3	4	5	6	7	
0	1	5%	5%	5%	5%	5%	5%	5%	
1	2	5%	5%	5%	5%	5%	5%	5%	
2	3	5%	5%	5%	5%	5%	5%	5%	
3	4	5%	5%	5%	5%	5%	5%	5%	
4	5	5%	5%	5%	5%	5%	5%	5%	
5	6	5%	5%	5%	5%	5%	5%	5%	
6	7	5%	5%	5%	5%	5%	5%	5%	
7	8	5%	15%	15%	15%	15%	15%	5%	
8	9	5%	45%	45%	45%	45%	45%	5%	
9	10	5%	50%	50%	50%	50%	50%	5%	
10	11	5%	50%	50%	50%	50%	50%	5%	
11	12	5%	50%	50%	50%	50%	50%	5%	
12	13	5%	45%	45%	45%	45%	45%	5%	
13	14	5%	45%	45%	45%	45%	45%	5%	
14	15	5%	45%	45%	45%	45%	45%	5%	
15	16	5%	25%	25%	25%	25%	25%	5%	
16	17	5%	10%	10%	10%	10%	10%	5%	
17	18	5%	5%	5%	5%	5%	5%	5%	
18	19	5%	5%	5%	5%	5%	5%	5%	
19	20	5%	5%	5%	5%	5%	5%	5%	
20	21	5%	5%	5%	5%	5%	5%	5%	
21	22	5%	5%	5%	5%	5%	5%	5%	
22	23	5%	5%	5%	5%	5%	5%	5%	
23	24	5%	5%	5%	5%	5%	5%	5%	

Baseline - C - Not Applicable									
Hour Sur			Mon	Tue	Wed	Thu	Fri	Sat	
From	То	1	2	3	4	5	6	7	
0	1	5%	5%	5%	5%	5%	5%	5%	
1	2	5%	5%	5%	5%	5%	5%	5%	
2	3	5%	5%	5%	5%	5%	5%	5%	
3	4	5%	5%	5%	5%	5%	5%	5%	
4	5	5%	5%	5%	5%	5%	5%	5%	
5	6	5%	5%	5%	5%	5%	5%	5%	
6	7	5%	5%	5%	5%	5%	5%	5%	
7	8	5%	10%	10%	10%	10%	10%	5%	
8	9	5%	15%	15%	15%	15%	15%	5%	
9	10	5%	15%	15%	15%	15%	15%	5%	
10	11	5%	15%	15%	15%	15%	15%	5%	
11	12	5%	15%	15%	15%	15%	15%	5%	
12	13	5%	15%	15%	15%	15%	15%	5%	
13	14	5%	15%	15%	15%	15%	15%	5%	
14	15	5%	15%	15%	15%	15%	15%	5%	
15	16	5%	15%	15%	15%	15%	15%	5%	
16	17	5%	10%	10%	10%	10%	10%	5%	
17	18	5%	5%	5%	5%	5%	5%	5%	
18	19	5%	5%	5%	5%	5%	5%	5%	
19	20	5%	5%	5%	5%	5%	5%	5%	
20	21	5%	5%	5%	5%	5%	5%	5%	
21	22	5%	5%	5%	5%	5%	5%	5%	
22	23	5%	5%	5%	5%	5%	5%	5%	
23	24	5%	5%	5%	5%	5%	5%	5%	

Proposed Plug Load Profiles (Percent of Peak Plug Load)

	,,,,,,	9		J			••••		
Proposed - A - Weekly Schedule									
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat	
From	То	1	2	3	4	5	6	7	
0	1	50%	50%	50%	50%	50%	50%	50%	
1	2	50%	50%	50%	50%	50%	50%	50%	
2	3	50%	50%	50%	50%	50%	50%	50%	
3	4	50%	50%	50%	50%	50%	50%	50%	
4	5	50%	50%	50%	50%	50%	50%	50%	
5	6	50%	50%	50%	50%	50%	50%	50%	
6	7	50%	50%	50%	50%	50%	50%	50%	
7	8	50%	50%	50%	50%	50%	50%	50%	
8	9	85%	85%	85%	85%	85%	85%	85%	
9	10	95%	95%	95%	95%	95%	95%	95%	
10	11	95%	95%	95%	95%	95%	95%	95%	
11	12	95%	95%	95%	95%	95%	95%	95%	
12	13	80%	80%	80%	80%	80%	80%	80%	
13	14	80%	80%	80%	80%	80%	80%	80%	
14	15	80%	80%	80%	80%	80%	80%	80%	
15	16	70%	70%	70%	70%	70%	70%	70%	
16	17	50%	50%	50%	50%	50%	50%	50%	
17	18	50%	50%	50%	50%	50%	50%	50%	
18	19	50%	50%	50%	50%	50%	50%	50%	
19	20	50%	50%	50%	50%	50%	50%	50%	
20	21	50%	50%	50%	50%	50%	50%	50%	
21	22	50%	50%	50%	50%	50%	50%	50%	
22	23	50%	50%	50%	50%	50%	50%	50%	
23	24	50%	50%	50%	50%	50%	50%	50%	

Proposed - B - Not Applicable									
Hour		Sun	Mon	Tue	Wed	Thu	Fri	Sat	
From	То	1	2	3	4	5	6	7	
0	1	5%	5%	5%	5%	5%	5%	5%	
1	2	5%	5%	5%	5%	5%	5%	5%	
2	3	5%	5%	5%	5%	5%	5%	5%	
3	4	5%	5%	5%	5%	5%	5%	5%	
4	5	5%	5%	5%	5%	5%	5%	5%	
5	6	5%	5%	5%	5%	5%	5%	5%	
6	7	5%	5%	5%	5%	5%	5%	5%	
7	8	5%	15%	15%	15%	15%	15%	5%	
8	9	5%	45%	45%	45%	45%	45%	5%	
9	10	5%	50%	50%	50%	50%	50%	5%	
10	11	5%	50%	50%	50%	50%	50%	5%	
11	12	5%	50%	50%	50%	50%	50%	5%	
12	13	5%	45%	45%	45%	45%	45%	5%	
13	14	5%	45%	45%	45%	45%	45%	5%	
14	15	5%	45%	45%	45%	45%	45%	5%	
15	16	5%	25%	25%	25%	25%	25%	5%	
16	17	5%	10%	10%	10%	10%	10%	5%	
17	18	5%	5%	5%	5%	5%	5%	5%	
18	19	5%	5%	5%	5%	5%	5%	5%	
19	20	5%	5%	5%	5%	5%	5%	5%	
20	21	5%	5%	5%	5%	5%	5%	5%	
21	22	5%	5%	5%	5%	5%	5%	5%	
22	23	5%	5%	5%	5%	5%	5%	5%	
23	24	5%	5%	5%	5%	5%	5%	5%	

Proposed - C - Not Applicable									
Но	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat	
From	То	1	2	3	4	5	6	7	
0	1	5%	5%	5%	5%	5%	5%	5%	
1	2	5%	5%	5%	5%	5%	5%	5%	
2	3	5%	5%	5%	5%	5%	5%	5%	
3	4	5%	5%	5%	5%	5%	5%	5%	
4	5	5%	5%	5%	5%	5%	5%	5%	
5	6	5%	5%	5%	5%	5%	5%	5%	
6	7	5%	5%	5%	5%	5%	5%	5%	
7	8	5%	10%	10%	10%	10%	10%	5%	
8	9	5%	15%	15%	15%	15%	15%	5%	
9	10	5%	15%	15%	15%	15%	15%	5%	
10	11	5%	15%	15%	15%	15%	15%	5%	
11	12	5%	15%	15%	15%	15%	15%	5%	
12	13	5%	15%	15%	15%	15%	15%	5%	
13	14	5%	15%	15%	15%	15%	15%	5%	
14	15	5%	15%	15%	15%	15%	15%	5%	
15	16	5%	15%	15%	15%	15%	15%	5%	
16	17	5%	10%	10%	10%	10%	10%	5%	
17	18	5%	5%	5%	5%	5%	5%	5%	
18	19	5%	5%	5%	5%	5%	5%	5%	
19	20	5%	5%	5%	5%	5%	5%	5%	
20	21	5%	5%	5%	5%	5%	5%	5%	
21	22	5%	5%	5%	5%	5%	5%	5%	
22	23	5%	5%	5%	5%	5%	5%	5%	
23	24	5%	5%	5%	5%	5%	5%	5%	

McK8760 - Calendar

05 Upgrade Single Pane Glazing



Calendar

Weekends Highlighted Yellow For Reference Year 1989

Month	1	2	3	4	5	6	7	8	9	10	11	12
Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
2	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
3	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
4	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
5	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
6	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
7	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
8	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
9	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
10	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
11	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
12	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
13	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
14	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
15	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
16	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
17	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
18	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
19	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
20	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
21	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
22	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
23	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
24	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
25	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
26	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
27	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
28	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
29	Α		Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
30	Α		Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
31	Α		Α		Α		Α	Α		Α		Α

Holidays and Observances: (Reference Year 1989)

Jan 1	New Year's Day	May 29	Memorial Day	Oct 31	Halloween
Jan 16	MLK Day	Jul 4	Independence Day	Nov 11	Veterans Day
Feb 20	Presidents' Day	Sep 4	Labor Day	Nov 23	Thanksgiving Day
Mar 26	Easter Sunday	Oct 9	Columbus Day	Dec 25	Christmas Day

Schedules Summary

Scenario	Scenario Title	Total Days/Yr	Total Hrs/Yr	Baseline HVAC On Hrs/Yr	Proposed HVAC On Hrs/Yr
Schedule A	Weekly Schedule	365	8,760	8,760	8,760
Schedule B	Not Applicable	0	0	0	0
Schedule C	Not Applicable	0	0	0	0
-		365	8,760	8,760	8,760

McK8760 - Inputs

O5 Upgrade Single Pane Glazing



Zone Inputs:

Tag	Variable Description		Units	Baseline	Proposed	Basis
I7	Floor Area		ft ²	21,400	21,400	
I8	Roof Area		ft ²	7,183	7,183	
I9	Opaque Wall Area		ft ²	7,027	7,027	
I10	Glazing Area	Glazing	ft ²	1,757	1,757	
I12	Roof U-Factor	Roof	BTU/ft ² /°F	0.200	0.200	
I13	Opaque Wall U-Factor	Walls	BTU/ft ² /°F	0.140	0.140	
I14	Glazing U-Factor	Glazing	BTU/ft ² /°F	1.100	0.590	
I15	Glazing Shading Heat Gain Coefficient	Glazing	-	1.000	0.900	
I16	Glazing Solar Gain Bldg Shape Factor		-	0.300	0.300	
I17	Average Space Height (Floor to Ceiling)		ft	9.0	9.0	
I18	Infiltration		ach	0.250	0.250	
I19	Peak Number of Occupants		Qty	20	20	
I20	Sensible Heat Gain Per Person		Btu/h	250	250	
I21	Latent Heat Gain Per Person		Btu/h	200	200	
I22	Peak Lighting Load Power Density		W/ft ²	1.200	1.200	
I23	Peak Plug Load Power Density		W/ft ²	0.300	0.300	
I24	Peak Miscellaneous Load (Electrical)		Watt	0	0	
I25	Miscellaneous Load Located in Conditioned Space		Yes/No	No	No	
I26	HVAC On Cooling Space Temperature Set Point		°F	74.0	74.0	
I27	HVAC Off Cooling Space Temperature Set Point		°F	74.0	74.0	
I28	HVAC On Heating Space Temperature Set Point		°F	72.0	71.0	
I29	HVAC Off Heating Space Temperature Set Point		°F	72.0	68.0	

AHU & Plant Inputs:

Tag	Variable Description		Units	Baseline	Proposed	Basis
I33	AHU Fan Power based on Control Type		Type	CV	CV	
I34	Maximum AHU CFM	CFM	17,300	17,300		
I35	Minimum AHU CFM (% of Maximum CFM)		%	100.0%	100.0%	
I36	Maximum % Outside Air (Economizer % OSA)		%	100.0%	100.0%	
I37	Minimum % Outside Air (Occupied)		%	34.2%	34.2%	
I38	Minimum % Outside Air (Unoccupied)		%	3.0%	3.0%	
I39	Economizer High Limit Set Point		°F	65.0	65.0	
I40	Demand Controlled Ventilation (For Outside Air Contro	ol)	Yes/No	No	No	
I41	DCV Airflow Per Person (Based on Space Type)	DCV Tab	CFM/Per	10.00	10.00	
I42	DCV Airflow Per Area (Based on Space Type)	CFM/ft ²	0.09	0.09		
I43	AHU Fan TSP (At Max CFM)	in w.c.	1.500	1.500		
I44	Fan Efficiency		%	60.0%	60.0%	
I45	Supply Air Temperature @ OAT>	81.0	°F	65	65	
I46	Supply Air Temperature @ OAT>	41.0	°F	75	75	
I47	AHU Cooling Efficiency (EER)		BTU/Watt	10.1	10.1	
I48	Evaporative Cooling Effectiveness		%	0.0%	0.0%	
I49	AHU Cooling Lockout Below		°F	50.0	50.0	
I50	AHU Heating Efficiency or COP @ OAT>	28.0	COP	0.88	0.88	
I51	AHU Heating Efficiency or COP @ OAT> 27.0		COP	0.88	0.88	
I52	AHU Heating Energy Source	Type	Natural Gas	Natural Gas		
I53	AHU Heating Lockout Above	°F	75.0	75.0		
I54	Heat Recovery % Effectiveness		%	0.0%	0.0%	

Terminal Devices Inputs (Reheat Coils, VAV Boxes, Baseboard Heaters, etc)

Tag	Variable Description			Baseline	Proposed	Basis
I58	Terminal Devices		Yes/No	Yes	Yes	
I59	Zone Heating Efficiency or COP @ OAT>	60.0	COP	0.88	0.88	
I60	Zone Heating Efficiency or COP @ OAT>	50.0	COP	0.88	0.88	
I61	Heating Energy Source Zone			Natural Gas	Natural Gas	
I62	Unoccupied Heating Done By	Zone, AHU	Zone Coil	Zone Coil		
I63	SFPMB Terminal Unit Power		W/CFM	0.00	0.00	

Domestic Hot Water Inputs:

DOTTIC	bornestie not water inputs.										
Tag	Variable Description	Units	Baseline	Proposed	Basis						
I67	DHW Fuel Type	Type	Natural Gas	Natural Gas							
I68	Energy Factor	-	0.82	0.82							
I69	Working Days Per Year (Used Only For DHW Calc)	Qty	180	180							
I70	Average Daily Hot Water Consumption Per Person	Gallons	1.0	1.0							
I71	Average Entering Cold Water Temperature	°F	50.0	50.0							
I72	Supply Hot Water Temperature	°F	120.0	120.0							

McK8760 - Outputs

05 Upgrade Single Pane Glazing



Electric Demand

Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
07	Cooling Peak kW (Month = 7)	kW	32	-	32	-	0	-
08	AHU Heating Peak kW (Month = 3)	kW	0	-	0	-	0	-
09	Zone Heating Peak kW (Month = 1)	kW	0	-	0	-	0	-
010	Fan Peak kW	kW	5	-	5	-	0	-
011	Lights Peak kW	kW	24	-	24	-	0	-
012	Plug Load Peak kW	kW	6	-	6	-	0	-
013	Miscellaneous Load Peak kW	kW	0		0	-	0	-
014	Other Peak kW	kW	0	-	0	-	0	-
015	Peak kW (Month = 7)	kW	62	-	62	-	0	-
016	Peak kW (Sum 12 Monthly Peaks)	kW	549	-	549	-	0	-

Electricity

Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
020	Cooling	kWh/Yr	13,236	2.11	13,007	2.07	229	0.04
021	AHU Heating	kWh/Yr	0	0.00	0	0.00	0	0.00
022	Zone Heating	kWh/Yr	0	0.00	0	0.00	0	0.00
023	AHU Fans	kWh/Yr	44,552	7.11	44,552	7.11	0	0.00
024	Zone Fans	kWh/Yr	0	0.00	0	0.00	0	0.00
025	Lights	kWh/Yr	105,197	16.78	105,197	16.78	0	0.00
026	Plug Loads	kWh/Yr	34,681	5.53	34,681	5.53	0	0.00
027	Miscellaneous Loads	kWh/Yr	0	0.00	0	0.00	0	0.00
028	Domestic Hot Water	kWh/Yr	0	0.00	0	0.00	0	0.00
029	Other Electricity	kWh/Yr	0	0.00	0	0.00	0	0.00
030	Total	kWh/Yr	197,665	31.52	197,436	31.49	229	0.04

Natural Gas

Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
034	AHU Heating	Therm/Yr	14,015	65.49	14,601	68.23	-586	-2.74
035	Zone Heating	Therm/Yr	4,730	22.10	1,802	8.42	2,928	13.68
036	Domestic Hot Water	Therm/Yr	26	0.12	26	0.12	0	0.00
037	Other Natural Gas	Therm/Yr	0	0.00	0	0.00	0	0.00
038	Total	Therm/Yr	18,771	87.71	16,428	76.77	2,342	10.95

Steam

Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
042	AHU Heating	kLB/Yr	0	0.00	0	0.00	0	0.00
043	Zone Heating	kLB/Yr	0	0.00	0	0.00	0	0.00
044	Domestic Hot Water	kLB/Yr	0	0.00	0	0.00	0	0.00
045	Other Steam	kLB/Yr	0	0.00	0	0.00	0	0.00
046	Total Steam	kLB/Yr	0	0.00	0	0.00	0	0.00

Total Energy

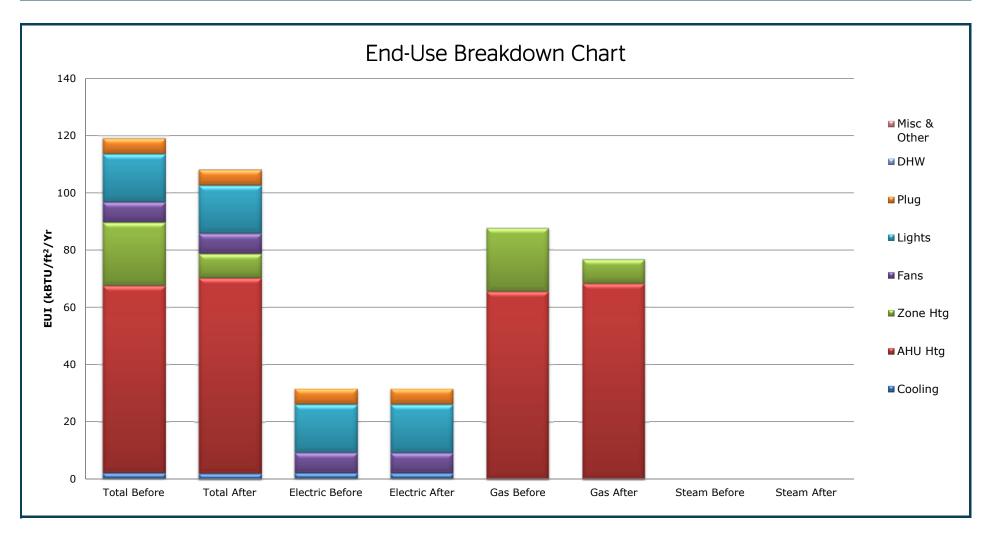
Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
050	Total Energy	kBtu/Yr	2,551,707	119.24	2,316,693	108.26	235,015	10.98

McK8760 - End-Use Breakdown





EUI By Category	Cooling	AHU Htg	Zone Htg	Fans	Lights	Plug	DHW	Misc & Other	Total
Total Before	2.11	65.49	22.10	7.11	16.78	5.53	0.12	0.00	119.24
Total After	2.07	68.23	8.42	7.11	16.78	5.53	0.12	0.00	108.26
Electric Before	2.11	0.00	0.00	7.11	16.78	5.53	0.00	0.00	31.52
Electric After	2.07	0.00	0.00	7.11	16.78	5.53	0.00	0.00	31.49
Gas Before	0.00	65.49	22.10	0.00	0.00	0.00	0.12	0.00	87.71
Gas After	0.00	68.23	8.42	0.00	0.00	0.00	0.12	0.00	76.77
Steam Before	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Steam After	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



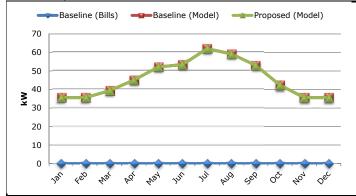
McK8760 - Model Tuning Charts

05 Upgrade Single Pane Glazing



#DIV/0!

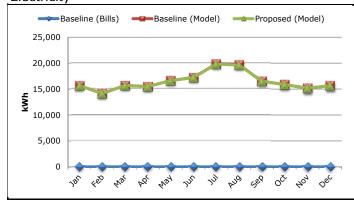
Electricity Demand



Month	Baseline (Bills)	Baseline (Model)	Proposed (Model)
Jan	0	36	36
Feb	0	36	36
Mar	0	39	39
Apr	0	45	45
May	0	52	52
Jun	0	54	54
Jul	0	62	62
Aug	0	59	59
Sep	0	53	53
Oct	0	42	42
Nov	0	36	36
Dec	0	36	36
Total	0	549	549
% Delta Between Base	eline (Bills) & Baseline	(Model)	100%

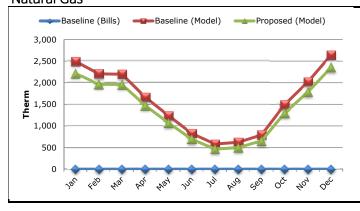
RSQ (Correlation Coefficient)

Electricity



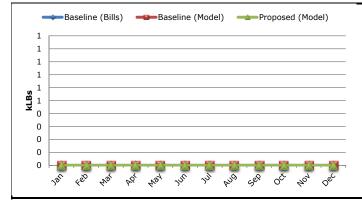
Month	Baseline (Bills)	Baseline (Model)	Proposed (Model)
Jan	0	15,660	15,660
Feb	0	14,147	14,147
Mar	0	15,691	15,691
Apr	0	15,498	15,497
May	0	16,639	16,622
Jun	0	17,237	17,200
Jul	0	19,874	19,793
Aug	0	19,707	19,634
Sep	0	16,504	16,483
Oct	0	15,886	15,887
Nov	0	15,159	15,159
Dec	0	15,665	15,665
Total	0	197,665	197,436
% Delta Between Base	eline (Bills) & Baseline	(Model)	100%
RSQ (Correlation Coef	ficient)		#DIV/0!

Natural Gas



Month	Baseline (Bills)	Baseline (Model)	Proposed (Model)
Jan	0	2,493	2,216
Feb	0	2,206	1,966
Mar	0	2,196	1,959
Apr	0	1,665	1,471
May	0	1,238	1,070
Jun	0	826	693
Jul	0	582	463
Aug	0	619	500
Sep	0	791	653
Oct	0	1,493	1,299
Nov	0	2,018	1,785
Dec	0	2,642	2,354
Total	0	18,771	16,428
% Delta Between Ba	aseline (Bills) & Baseline	(Model)	100%
RSQ (Correlation Co	efficient)		#DIV/0!

Steam



Month	Baseline (Bills)	Baseline (Model)	Proposed (Model)
Jan	0	0	0
Feb	0	0	0
Mar	0	0	0
Apr	0	0	0
May	0	0	0
Jun	0	0	0
Jul	0	0	0
Aug	0	0	0
Sep	0	0	0
Oct	0	0	0
Nov	0	0	0
Dec	0	0	0
Total	0	0	0

% Delta Between Baseline (Bills) & Baseline (Model)	#DIV/0!
RSQ (Correlation Coefficient)	#DIV/0!

Facility Improvement Measure (FIM) Detail

Project	WA Governor's Residence
Scenario	FINAL
Date	December 2, 2013



FIM ID 20170 Facility WA Governors Mansion		
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FIM Name 08 Provide Demand Controlled Ventilation

FIM Description

The intent of this measure is to provide CO2 based demand controlled ventilation for the chilled water air handling units serving the occupied areas of the Governor's Residence.

Existing: The existing air handling units do not have a means of reducing airflows to match the building occupancy.

Proposed: Provide room sensor based demand controlled ventilation for the chilled water air handling units, including sensors, controls, commissioning, and appurtenances.

Benefits: Heating and cooling energy usage associated with the conditioning of ventilation air will be reduced through reducing ventilation rates to match building occupancy.

Savings Methodology

Annual savings is calculated using a bin calculation calibrated to match the consumption recorded by the steam, electric, and chilled water submeters serving the residence. Baseline minimum ventilation rates are based on a logger data analysis of fancoil units FCU-102, FCU-105, and FCU-201 using data collected from 5/24/2013 thru 6/10/2013. Proposed minimum ventilation rates are based on a 15% minimum outside air delivery rate when FC-101 is not scheduled occupied based on the proposed method of CO2 control and the age of the building, and FC-101 is assumed to be scheduled occupied for eight hours per day. The calculations take into account the heating system efficiency improvements included within the scope of FIM 01 Provide Decentralized Boiler, and the glazing improvements included in the scope of FIM 05 Upgrade Single Pane Glazing.

Utility Savings			
Utility Type	Utility Unit	Quantity Savings	Dollar Savings
Electricity	kWh	503	\$29
Electric Demand	kW	17	\$63
Natural Gas	Therm	6,844	\$3,900
Water	kgal	0	\$0
Sewer	kgal	0	\$0
Total			\$3,992

Confidential & Proprietary

McK8760 - HVAC Schedules

08 Provide Demand Controlled Ventilation



1 = Scheduled ON

Baseline HVAC Equipment Daily Schedules

	Baseline - A - Weekly Schedule										
Н	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat			
From	То										
0	1	1	1	1	1	1	1	1			
1	2	1	1	1	1	1	1	1			
2	3	1	1	1	1	1	1	1			
3	4	1	1	1	1	1	1	1			
4	5	1	1	1	1	1	1	1			
5	6	1	1	1	1	1	1	1			
6	7	1	1	1	1	1	1	1			
7	8	1	1	1	1	1	1	1			
8	9	1	1	1	1	1	1	1			
9	10	1	1	1	1	1	1	1			
10	11	1	1	1	1	1	1	1			
11	12	1	1	1	1	1	1	1			
12	13	1	1	1	1	1	1	1			
13	14	1	1	1	1	1	1	1			
14	15	1	1	1	1	1	1	1			
15	16	1	1	1	1	1	1	1			
16	17	1	1	1	1	1	1	1			
17	18	1	1	1	1	1	1	1			
18	19	1	1	1	1	1	1	1			
19	20	1	1	1	1	1	1	1			
20	21	1	1	1	1	1	1	1			
21	22	1	1	1	1	1	1	1			
22	23	1	1	1	1	1	1	1			
23	24	1	1	1	1	1	1	1			
Daily	Totals	24	24	24	24	24	24	24			

		Ва	seline -	B - Not	Applical	ole		
Н	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То	1	2	3	4	5	6	7
0	1	0	0	0	0	0	0	0
1	2	0	0	0	0	0	0	0
2	3	0	0	0	0	0	0	0
3	4	0	0	0	0	0	0	0
4	5	0	0	0	0	0	0	0
5	6	0	0	0	0	0	0	0
6	7	0	0	0	0	0	0	0
7	8	0	1	1	1	1	1	0
8	9	0	1	1	1	1	1	0
9	10	0	1	1	1	1	1	0
10	11	0	1	1	1	1	1	0
11	12	0	1	1	1	1	1	0
12	13	0	1	1	1	1	1	0
13	14	0	1	1	1	1	1	0
14	15	0	1	1	1	1	1	0
15	16	0	1	1	1	1	1	0
16	17	0	0	0	0	0	0	0
17	18	0	0	0	0	0	0	0
18	19	0	0	0	0	0	0	0
19	20	0	0	0	0	0	0	0
20	21	0	0	0	0	0	0	0
21	22	0	0	0	0	0	0	0
22	23	0	0	0	0	0	0	0
23	24	0	0	0	0	0	0	0
Daily	Totals	0	9	9	9	9	9	0

		Ba	seline -	C - Not	Applical	ble		
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То	1	2	3	4	5	6	7
0	1	0	0	0	0	0	0	0
1	2	0	0	0	0	0	0	0
2	3	0	0	0	0	0	0	0
3	4	0	0	0	0	0	0	0
4	5	0	0	0	0	0	0	0
5	6	0	0	0	0	0	0	0
6	7	0	0	0	0	0	0	0
7	8	0	0	0	0	0	0	0
8	9	0	0	0	0	0	0	0
9	10	0	1	1	1	1	1	0
10	11	0	1	1	1	1	1	0
11	12	0	1	1	1	1	1	0
12	13	0	1	1	1	1	1	0
13	14	0	1	1	1	1	1	0
14	15	0	1	1	1	1	1	0
15	16	0	0	0	0	0	0	0
16	17	0	0	0	0	0	0	0
17	18	0	0	0	0	0	0	0
18	19	0	0	0	0	0	0	0
19	20	0	0	0	0	0	0	0
20	21	0	0	0	0	0	0	0
21	22	0	0	0	0	0	0	0
22	23	0	0	0	0	0	0	0
23	24	0	0	0	0	0	0	0
Daily	Totals	0	6	6	6	6	6	0

0 = Schedule OFF

Proposed HVAC Equipment Daily Schedules

	Proposed - A - Weekly Schedule									
Н	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То	1	2	3	4	5	6	7		
0	1	1	1	1	1	1	1	1		
1	2	1	1	1	1	1	1	1		
2	3	1	1	1	1	1	1	1		
3	4	1	1	1	1	1	1	1		
4	5	1	1	1	1	1	1	1		
5	6	1	1	1	1	1	1	1		
6	7	1	1	1	1	1	1	1		
7	8	1	1	1	1	1	1	1		
8	9	1	1	1	1	1	1	1		
9	10	1	1	1	1	1	1	1		
10	11	1	1	1	1	1	1	1		
11	12	1	1	1	1	1	1	1		
12	13	1	1	1	1	1	1	1		
13	14	1	1	1	1	1	1	1		
14	15	1	1	1	1	1	1	1		
15	16	1	1	1	1	1	1	1		
16	17	1	1	1	1	1	1	1		
17	18	1	1	1	1	1	1	1		
18	19	1	1	1	1	1	1	1		
19	20	1	1	1	1	1	1	1		
20	21	1	1	1	1	1	1	1		
21	22	1	1	1	1	1	1	1		
22	23	1	1	1	1	1	1	1		
23	24	1	1	1	1	1	1	1		
Daily	Totals	24	24	24	24	24	24	24		

	Proposed - B - Not Applicable									
Н	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То	1	2	3	4	5	6	7		
0	1	0	0	0	0	0	0	0		
1	2	0	0	0	0	0	0	0		
2	3	0	0	0	0	0	0	0		
3	4	0	0	0	0	0	0	0		
4	5	0	0	0	0	0	0	0		
5	6	0	0	0	0	0	0	0		
6	7	0	0	0	0	0	0	0		
7	8	0	1	1	1	1	1	0		
8	9	0	1	1	1	1	1	0		
9	10	0	1	1	1	1	1	0		
10	11	0	1	1	1	1	1	0		
11	12	0	1	1	1	1	1	0		
12	13	0	1	1	1	1	1	0		
13	14	0	1	1	1	1	1	0		
14	15	0	1	1	1	1	1	0		
15	16	0	1	1	1	1	1	0		
16	17	0	0	0	0	0	0	0		
17	18	0	0	0	0	0	0	0		
18	19	0	0	0	0	0	0	0		
19	20	0	0	0	0	0	0	0		
20	21	0	0	0	0	0	0	0		
21	22	0	0	0	0	0	0	0		
22	23	0	0	0	0	0	0	0		
23	24	0	0	0	0	0	0	0		
Daily	Totals	0	9	9	9	9	9	0		

0 = Schedule OFF	1 = Scheduled ON
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Proposed - C - Not Applicable								
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То	1	2	3	4	5	6	
0	1	0	0	0	0	0	0	0
1	2	0	0	0	0	0	0	0
2	3	0	0	0	0	0	0	0
3	4	0	0	0	0	0	0	0
4	5	0	0	0	0	0	0	0
5	6	0	0	0	0	0	0	0
6	7	0	0	0	0	0	0	0
7	8	0	0	0	0	0	0	0
8	9	0	0	0	0	0	0	0
9	10	0	1	1	1	1	1	0
10	11	0	1	1	1	1	1	0
11	12	0	1	1	1	1	1	0
12	13	0	1	1	1	1	1	0
13	14	0	1	1	1	1	1	0
14	15	0	1	1	1	1	1	0
15	16	0	0	0	0	0	0	0
16	17	0	0	0	0	0	0	0
17	18	0	0	0	0	0	0	0
18	19	0	0	0	0	0	0	0
19	20	0	0	0	0	0	0	0
20	21	0	0	0	0	0	0	0
21	22	0	0	0	0	0	0	0
22	23	0	0	0	0	0	0	0
23	24	0	0	0	0	0	0	0
Daily	Totals	0	6	6	6	6	6	0

McK8760 - Occupancy Schedules

08 Provide Demand Controlled Ventilation



Baseline Occupancy Load Profiles (Percent of Peak Occupancy)

			eline - <i>P</i>				10 01 1	
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То	1	2	3	4	5	6	7
0	1	20%	20%	20%	20%	20%	20%	20%
1	2	20%	20%	20%	20%	20%	20%	20%
2	3	20%	20%	20%	20%	20%	20%	20%
3	4	20%	20%	20%	20%	20%	20%	20%
4	5	20%	20%	20%	20%	20%	20%	20%
5	6	20%	20%	20%	20%	20%	20%	20%
6	7	20%	20%	20%	20%	20%	20%	20%
7	8	20%	20%	20%	20%	20%	20%	20%
8	9	20%	20%	20%	20%	20%	20%	20%
9	10	90%	90%	90%	90%	90%	90%	90%
10	11	90%	90%	90%	90%	90%	90%	90%
11	12	80%	80%	80%	80%	80%	80%	80%
12	13	80%	80%	80%	80%	80%	80%	80%
13	14	80%	80%	80%	80%	80%	80%	80%
14	15	80%	80%	80%	80%	80%	80%	80%
15	16	45%	45%	45%	45%	45%	45%	45%
16	17	20%	20%	20%	20%	20%	20%	20%
17	18	20%	20%	20%	20%	20%	20%	20%
18	19	20%	20%	20%	20%	20%	20%	20%
19	20	20%	20%	20%	20%	20%	20%	20%
20	21	20%	20%	20%	20%	20%	20%	20%
21	22	20%	20%	20%	20%	20%	20%	20%
22	23	20%	20%	20%	20%	20%	20%	20%
23	24	20%	20%	20%	20%	20%	20%	20%

	Baseline - B - Not Applicable										
Hour Sun			Mon	Tue	Wed	Thu	Fri	Sat			
From	То	1	2	3	4	5	6				
0	1	0%	0%	0%	0%	0%	0%	0%			
1	2	0%	0%	0%	0%	0%	0%	0%			
2	3	0%	0%	0%	0%	0%	0%	0%			
3	4	0%	0%	0%	0%	0%	0%	0%			
4	5	0%	0%	0%	0%	0%	0%	0%			
5	6	0%	0%	0%	0%	0%	0%	0%			
6	7	0%	0%	0%	0%	0%	0%	0%			
7	8	0%	2%	2%	2%	2%	2%	0%			
8	9	0%	35%	35%	35%	35%	35%	0%			
9	10	0%	45%	45%	45%	45%	45%	0%			
10	11	0%	45%	45%	45%	45%	45%	0%			
11	12	0%	40%	40%	40%	40%	40%	0%			
12	13	0%	40%	40%	40%	40%	40%	0%			
13	14	0%	40%	40%	40%	40%	40%	0%			
14	15	0%	40%	40%	40%	40%	40%	0%			
15	16	0%	25%	25%	25%	25%	25%	0%			
16	17	0%	2%	2%	2%	2%	2%	0%			
17	18	0%	0%	0%	0%	0%	0%	0%			
18	19	0%	0%	0%	0%	0%	0%	0%			
19	20	0%	0%	0%	0%	0%	0%	0%			
20	21	0%	0%	0%	0%	0%	0%	0%			
21	22	0%	0%	0%	0%	0%	0%	0%			
22	23	0%	0%	0%	0%	0%	0%	0%			
23	24	0%	0%	0%	0%	0%	0%	0%			

	Baseline - C - Not Applicable										
Но	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat			
From	То	1	2	3	4	5	6	7			
0	1	0%	0%	0%	0%	0%	0%	0%			
1	2	0%	0%	0%	0%	0%	0%	0%			
2	3	0%	0%	0%	0%	0%	0%	0%			
3	4	0%	0%	0%	0%	0%	0%	0%			
4	5	0%	0%	0%	0%	0%	0%	0%			
5	6	0%	0%	0%	0%	0%	0%	0%			
6	7	0%	0%	0%	0%	0%	0%	0%			
7	8	0%	2%	2%	2%	2%	2%	0%			
8	9	0%	5%	5%	5%	5%	5%	0%			
9	10	0%	5%	5%	5%	5%	5%	0%			
10	11	0%	5%	5%	5%	5%	5%	0%			
11	12	0%	5%	5%	5%	5%	5%	0%			
12	13	0%	5%	5%	5%	5%	5%	0%			
13	14	0%	5%	5%	5%	5%	5%	0%			
14	15	0%	5%	5%	5%	5%	5%	0%			
15	16	0%	2%	2%	2%	2%	2%	0%			
16	17	0%	2%	2%	2%	2%	2%	0%			
17	18	0%	0%	0%	0%	0%	0%	0%			
18	19	0%	0%	0%	0%	0%	0%	0%			
19	20	0%	0%	0%	0%	0%	0%	0%			
20	21	0%	0%	0%	0%	0%	0%	0%			
21	22	0%	0%	0%	0%	0%	0%	0%			
22	23	0%	0%	0%	0%	0%	0%	0%			
23	24	0%	0%	0%	0%	0%	0%	0%			

Proposed Occupancy Load Profiles (Percent of Peak Occupancy)

	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	осирс	, _			,, ,, , ,		
		Prop	osed - /	A - Wee	kly Sche	dule		
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То	1	2	3	4	5	6	7
0	1	20%	20%	20%	20%	20%	20%	20%
1	2	20%	20%	20%	20%	20%	20%	20%
2	3	20%	20%	20%	20%	20%	20%	20%
3	4	20%	20%	20%	20%	20%	20%	20%
4	5	20%	20%	20%	20%	20%	20%	20%
5	6	20%	20%	20%	20%	20%	20%	20%
6	7	20%	20%	20%	20%	20%	20%	20%
7	8	20%	20%	20%	20%	20%	20%	20%
8	9	20%	20%	20%	20%	20%	20%	20%
9	10	90%	90%	90%	90%	90%	90%	90%
10	11	90%	90%	90%	90%	90%	90%	90%
11	12	80%	80%	80%	80%	80%	80%	80%
12	13	80%	80%	80%	80%	80%	80%	80%
13	14	80%	80%	80%	80%	80%	80%	80%
14	15	80%	80%	80%	80%	80%	80%	80%
15	16	45%	45%	45%	45%	45%	45%	45%
16	17	20%	20%	20%	20%	20%	20%	20%
17	18	20%	20%	20%	20%	20%	20%	20%
18	19	20%	20%	20%	20%	20%	20%	20%
19	20	20%	20%	20%	20%	20%	20%	20%
20	21	20%	20%	20%	20%	20%	20%	20%
21	22	20%	20%	20%	20%	20%	20%	20%
22	23	20%	20%	20%	20%	20%	20%	20%
23	24	20%	20%	20%	20%	20%	20%	20%

	Proposed - B - Not Applicable										
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat			
From	То	1	2	3	4	5	6	7			
0	1	0%	0%	0%	0%	0%	0%	0%			
1	2	0%	0%	0%	0%	0%	0%	0%			
2	3	0%	0%	0%	0%	0%	0%	0%			
3	4	0%	0%	0%	0%	0%	0%	0%			
4	5	0%	0%	0%	0%	0%	0%	0%			
5	6	0%	0%	0%	0%	0%	0%	0%			
6	7	0%	0%	0%	0%	0%	0%	0%			
7	8	0%	2%	2%	2%	2%	2%	0%			
8	9	0%	35%	35%	35%	35%	35%	0%			
9	10	0%	45%	45%	45%	45%	45%	0%			
10	11	0%	45%	45%	45%	45%	45%	0%			
11	12	0%	40%	40%	40%	40%	40%	0%			
12	13	0%	40%	40%	40%	40%	40%	0%			
13	14	0%	40%	40%	40%	40%	40%	0%			
14	15	0%	40%	40%	40%	40%	40%	0%			
15	16	0%	25%	25%	25%	25%	25%	0%			
16	17	0%	2%	2%	2%	2%	2%	0%			
17	18	0%	0%	0%	0%	0%	0%	0%			
18	19	0%	0%	0%	0%	0%	0%	0%			
19	20	0%	0%	0%	0%	0%	0%	0%			
20	21	0%	0%	0%	0%	0%	0%	0%			
21	22	0%	0%	0%	0%	0%	0%	0%			
22	23	0%	0%	0%	0%	0%	0%	0%			
23	24	0%	0%	0%	0%	0%	0%	0%			

	Proposed - C - Not Applicable									
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То	1	2	3	4	5	6	7		
0	1	0%	0%	0%	0%	0%	0%	0%		
1	2	0%	0%	0%	0%	0%	0%	0%		
2	3	0%	0%	0%	0%	0%	0%	0%		
3	4	0%	0%	0%	0%	0%	0%	0%		
4	5	0%	0%	0%	0%	0%	0%	0%		
5	6	0%	0%	0%	0%	0%	0%	0%		
6	7	0%	0%	0%	0%	0%	0%	0%		
7	8	0%	2%	2%	2%	2%	2%	0%		
8	9	0%	5%	5%	5%	5%	5%	0%		
9	10	0%	5%	5%	5%	5%	5%	0%		
10	11	0%	5%	5%	5%	5%	5%	0%		
11	12	0%	5%	5%	5%	5%	5%	0%		
12	13	0%	5%	5%	5%	5%	5%	0%		
13	14	0%	5%	5%	5%	5%	5%	0%		
14	15	0%	5%	5%	5%	5%	5%	0%		
15	16	0%	2%	2%	2%	2%	2%	0%		
16	17	0%	2%	2%	2%	2%	2%	0%		
17	18	0%	0%	0%	0%	0%	0%	0%		
18	19	0%	0%	0%	0%	0%	0%	0%		
19	20	0%	0%	0%	0%	0%	0%	0%		
20	21	0%	0%	0%	0%	0%	0%	0%		
21	22	0%	0%	0%	0%	0%	0%	0%		
22	23	0%	0%	0%	0%	0%	0%	0%		
23	24	0%	0%	0%	0%	0%	0%	0%		

McK8760 - Lighting Schedules

O8 Provide Demand Controlled Ventilation



Baseline Lighting Load Profiles (Percent of Peak Lighting Load)

baseline Lighting Load Profiles (Percent of Peak Lightin									
		Bas	eline - A	A - Week	dy Sche	dule			
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat	
From	То		2						
0	1	20%	20%	20%	20%	20%	20%	20%	
1	2	20%	20%	20%	20%	20%	20%	20%	
2	3	20%	20%	20%	20%	20%	20%	20%	
3	4	20%	20%	20%	20%	20%	20%	20%	
4	5	20%	20%	20%	20%	20%	20%	20%	
5	6	20%	20%	20%	20%	20%	20%	20%	
6	7	20%	20%	20%	20%	20%	20%	20%	
7	8	20%	30%	30%	30%	30%	30%	20%	
8	9	85%	85%	85%	85%	85%	85%	85%	
9	10	95%	95%	95%	95%	95%	95%	95%	
10	11	95%	95%	95%	95%	95%	95%	95%	
11	12	95%	95%	95%	95%	95%	95%	95%	
12	13	80%	80%	80%	80%	80%	80%	80%	
13	14	80%	80%	80%	80%	80%	80%	80%	
14	15	80%	80%	80%	80%	80%	80%	80%	
15	16	70%	70%	70%	70%	70%	70%	70%	
16	17	50%	50%	50%	50%	50%	50%	50%	
17	18	50%	50%	50%	50%	50%	50%	50%	
18	19	35%	35%	35%	35%	35%	35%	35%	
19	20	35%	35%	35%	35%	35%	35%	35%	
20	21	35%	35%	35%	35%	35%	35%	35%	
21	22	30%	30%	30%	30%	30%	30%	30%	
22	23	20%	20%	20%	20%	20%	20%	20%	
23	24	20%	20%	20%	20%	20%	20%	20%	

Baseline - B - Not Applicable									
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat	
From	То	1	2	3	4	5	6	7	
0	1	5%	5%	5%	5%	5%	5%	5%	
1	2	5%	5%	5%	5%	5%	5%	5%	
2	3	5%	5%	5%	5%	5%	5%	5%	
3	4	5%	5%	5%	5%	5%	5%	5%	
4	5	5%	5%	5%	5%	5%	5%	5%	
5	6	5%	5%	5%	5%	5%	5%	5%	
6	7	5%	5%	5%	5%	5%	5%	5%	
7	8	5%	15%	15%	15%	15%	15%	5%	
8	9	5%	45%	45%	45%	45%	45%	5%	
9	10	5%	50%	50%	50%	50%	50%	5%	
10	11	5%	50%	50%	50%	50%	50%	5%	
11	12	5%	50%	50%	50%	50%	50%	5%	
12	13	5%	45%	45%	45%	45%	45%	5%	
13	14	5%	45%	45%	45%	45%	45%	5%	
14	15	5%	45%	45%	45%	45%	45%	5%	
15	16	5%	25%	25%	25%	25%	25%	5%	
16	17	5%	15%	15%	15%	15%	15%	5%	
17	18	5%	15%	15%	15%	15%	15%	5%	
18	19	5%	15%	15%	15%	15%	15%	5%	
19	20	5%	15%	15%	15%	15%	15%	5%	
20	21	5%	15%	15%	15%	15%	15%	5%	
21	22	5%	15%	15%	15%	15%	15%	5%	
22	23	5%	5%	5%	5%	5%	5%	5%	
23	24	5%	5%	5%	5%	5%	5%	5%	

		Ва	seline -	C - Not	Applical	ole		
Н	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То	1	2	3	4	5	6	7
0	1	5%	5%	5%	5%	5%	5%	5%
1	2	5%	5%	5%	5%	5%	5%	5%
2	3	5%	5%	5%	5%	5%	5%	5%
3	4	5%	5%	5%	5%	5%	5%	5%
4	5	5%	5%	5%	5%	5%	5%	5%
5	6	5%	5%	5%	5%	5%	5%	5%
6	7	5%	5%	5%	5%	5%	5%	5%
7	8	5%	10%	10%	10%	10%	10%	5%
8	9	5%	15%	15%	15%	15%	15%	5%
9	10	5%	25%	25%	25%	25%	25%	5%
10	11	5%	25%	25%	25%	25%	25%	5%
11	12	5%	25%	25%	25%	25%	25%	5%
12	13	5%	25%	25%	25%	25%	25%	5%
13	14	5%	25%	25%	25%	25%	25%	5%
14	15	5%	25%	25%	25%	25%	25%	5%
15	16	5%	15%	15%	15%	15%	15%	5%
16	17	5%	10%	10%	10%	10%	10%	5%
17	18	5%	5%	5%	5%	5%	5%	5%
18	19	5%	5%	5%	5%	5%	5%	5%
19	20	5%	5%	5%	5%	5%	5%	5%
20	21	5%	5%	5%	5%	5%	5%	5%
21	22	5%	5%	5%	5%	5%	5%	5%
22	23	5%	5%	5%	5%	5%	5%	5%
23	24	5%	5%	5%	5%	5%	5%	5%

Proposed Lighting Load Profiles (Percent of Peak Lighting Load)

repeased highling head remains the reality of reality high									
		Prop	osed - /	۹ - Wee	kly Sche	dule			
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat	
From	То	1	2	3	4	5	6	7	
0	1	20%	20%	20%	20%	20%	20%	20%	
1	2	20%	20%	20%	20%	20%	20%	20%	
2	3	20%	20%	20%	20%	20%	20%	20%	
3	4	20%	20%	20%	20%	20%	20%	20%	
4	5	20%	20%	20%	20%	20%	20%	20%	
5	6	20%	20%	20%	20%	20%	20%	20%	
6	7	20%	20%	20%	20%	20%	20%	20%	
7	8	20%	30%	30%	30%	30%	30%	20%	
8	9	85%	85%	85%	85%	85%	85%	85%	
9	10	95%	95%	95%	95%	95%	95%	95%	
10	11	95%	95%	95%	95%	95%	95%	95%	
11	12	95%	95%	95%	95%	95%	95%	95%	
12	13	80%	80%	80%	80%	80%	80%	80%	
13	14	80%	80%	80%	80%	80%	80%	80%	
14	15	80%	80%	80%	80%	80%	80%	80%	
15	16	70%	70%	70%	70%	70%	70%	70%	
16	17	50%	50%	50%	50%	50%	50%	50%	
17	18	50%	50%	50%	50%	50%	50%	50%	
18	19	35%	35%	35%	35%	35%	35%	35%	
19	20	35%	35%	35%	35%	35%	35%	35%	
20	21	35%	35%	35%	35%	35%	35%	35%	
21	22	30%	30%	30%	30%	30%	30%	30%	
22	23	20%	20%	20%	20%	20%	20%	20%	
23	24	20%	20%	20%	20%	20%	20%	20%	

	Proposed - B - Not Applicable										
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat			
From	То	1	2	3	4	5	6	7			
0	1	5%	5%	5%	5%	5%	5%	5%			
1	2	5%	5%	5%	5%	5%	5%	5%			
2	3	5%	5%	5%	5%	5%	5%	5%			
3	4	5%	5%	5%	5%	5%	5%	5%			
4	5	5%	5%	5%	5%	5%	5%	5%			
5	6	5%	5%	5%	5%	5%	5%	5%			
6	7	5%	5%	5%	5%	5%	5%	5%			
7	8	5%	15%	15%	15%	15%	15%	5%			
8	9	5%	45%	45%	45%	45%	45%	5%			
9	10	5%	50%	50%	50%	50%	50%	5%			
10	11	5%	50%	50%	50%	50%	50%	5%			
11	12	5%	50%	50%	50%	50%	50%	5%			
12	13	5%	45%	45%	45%	45%	45%	5%			
13	14	5%	45%	45%	45%	45%	45%	5%			
14	15	5%	45%	45%	45%	45%	45%	5%			
15	16	5%	25%	25%	25%	25%	25%	5%			
16	17	5%	15%	15%	15%	15%	15%	5%			
17	18	5%	15%	15%	15%	15%	15%	5%			
18	19	5%	15%	15%	15%	15%	15%	5%			
19	20	5%	15%	15%	15%	15%	15%	5%			
20	21	5%	15%	15%	15%	15%	15%	5%			
21	22	5%	15%	15%	15%	15%	15%	5%			
22	23	5%	5%	5%	5%	5%	5%	5%			
23	24	5%	5%	5%	5%	5%	5%	5%			

	Proposed - C - Not Applicable									
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То	1	2	3	4	5	6	7		
0	1	5%	5%	5%	5%	5%	5%	5%		
1	2	5%	5%	5%	5%	5%	5%	5%		
2	3	5%	5%	5%	5%	5%	5%	5%		
3	4	5%	5%	5%	5%	5%	5%	5%		
4	5	5%	5%	5%	5%	5%	5%	5%		
5	6	5%	5%	5%	5%	5%	5%	5%		
6	7	5%	5%	5%	5%	5%	5%	5%		
7	8	5%	10%	10%	10%	10%	10%	5%		
8	9	5%	15%	15%	15%	15%	15%	5%		
9	10	5%	25%	25%	25%	25%	25%	5%		
10	11	5%	25%	25%	25%	25%	25%	5%		
11	12	5%	25%	25%	25%	25%	25%	5%		
12	13	5%	25%	25%	25%	25%	25%	5%		
13	14	5%	25%	25%	25%	25%	25%	5%		
14	15	5%	25%	25%	25%	25%	25%	5%		
15	16	5%	15%	15%	15%	15%	15%	5%		
16	17	5%	10%	10%	10%	10%	10%	5%		
17	18	5%	5%	5%	5%	5%	5%	5%		
18	19	5%	5%	5%	5%	5%	5%	5%		
19	20	5%	5%	5%	5%	5%	5%	5%		
20	21	5%	5%	5%	5%	5%	5%	5%		
21	22	5%	5%	5%	5%	5%	5%	5%		
22	23	5%	5%	5%	5%	5%	5%	5%		
23	24	5%	5%	5%	5%	5%	5%	5%		

McK8760 - Plug Load Schedules

08 Provide Demand Controlled Ventilation



Baseline Plug Load Profiles (Percent of Peak Plug Load)

	110110		eline - <i>P</i>					g Lou
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То		2					7
0	1	50%	50%	50%	50%	50%	50%	50%
1	2	50%	50%	50%	50%	50%	50%	50%
2	3	50%	50%	50%	50%	50%	50%	50%
3	4	50%	50%	50%	50%	50%	50%	50%
4	5	50%	50%	50%	50%	50%	50%	50%
5	6	50%	50%	50%	50%	50%	50%	50%
6	7	50%	50%	50%	50%	50%	50%	50%
7	8	50%	50%	50%	50%	50%	50%	50%
8	9	85%	85%	85%	85%	85%	85%	85%
9	10	95%	95%	95%	95%	95%	95%	95%
10	11	95%	95%	95%	95%	95%	95%	95%
11	12	95%	95%	95%	95%	95%	95%	95%
12	13	80%	80%	80%	80%	80%	80%	80%
13	14	80%	80%	80%	80%	80%	80%	80%
14	15	80%	80%	80%	80%	80%	80%	80%
15	16	70%	70%	70%	70%	70%	70%	70%
16	17	50%	50%	50%	50%	50%	50%	50%
17	18	50%	50%	50%	50%	50%	50%	50%
18	19	50%	50%	50%	50%	50%	50%	50%
19	20	50%	50%	50%	50%	50%	50%	50%
20	21	50%	50%	50%	50%	50%	50%	50%
21	22	50%	50%	50%	50%	50%	50%	50%
22	23	50%	50%	50%	50%	50%	50%	50%
23	24	50%	50%	50%	50%	50%	50%	50%

	Baseline - B - Not Applicable										
Ho	ur	Sun	Mon	Tue	Wed	Thu	Fri	Sat			
From	То	1	2	3	4	5	6	7			
0	1	5%	5%	5%	5%	5%	5%	5%			
1	2	5%	5%	5%	5%	5%	5%	5%			
2	3	5%	5%	5%	5%	5%	5%	5%			
3	4	5%	5%	5%	5%	5%	5%	5%			
4	5	5%	5%	5%	5%	5%	5%	5%			
5	6	5%	5%	5%	5%	5%	5%	5%			
6	7	5%	5%	5%	5%	5%	5%	5%			
7	8	5%	15%	15%	15%	15%	15%	5%			
8	9	5%	45%	45%	45%	45%	45%	5%			
9	10	5%	50%	50%	50%	50%	50%	5%			
10	11	5%	50%	50%	50%	50%	50%	5%			
11	12	5%	50%	50%	50%	50%	50%	5%			
12	13	5%	45%	45%	45%	45%	45%	5%			
13	14	5%	45%	45%	45%	45%	45%	5%			
14	15	5%	45%	45%	45%	45%	45%	5%			
15	16	5%	25%	25%	25%	25%	25%	5%			
16	17	5%	10%	10%	10%	10%	10%	5%			
17	18	5%	5%	5%	5%	5%	5%	5%			
18	19	5%	5%	5%	5%	5%	5%	5%			
19	20	5%	5%	5%	5%	5%	5%	5%			
20	21	5%	5%	5%	5%	5%	5%	5%			
21	22	5%	5%	5%	5%	5%	5%	5%			
22	23	5%	5%	5%	5%	5%	5%	5%			
23	24	5%	5%	5%	5%	5%	5%	5%			

Baseline - C - Not Applicable										
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То	1	2	3	4	5	6	7		
0	1	5%	5%	5%	5%	5%	5%	5%		
1	2	5%	5%	5%	5%	5%	5%	5%		
2	3	5%	5%	5%	5%	5%	5%	5%		
3	4	5%	5%	5%	5%	5%	5%	5%		
4	5	5%	5%	5%	5%	5%	5%	5%		
5	6	5%	5%	5%	5%	5%	5%	5%		
6	7	5%	5%	5%	5%	5%	5%	5%		
7	8	5%	10%	10%	10%	10%	10%	5%		
8	9	5%	15%	15%	15%	15%	15%	5%		
9	10	5%	15%	15%	15%	15%	15%	5%		
10	11	5%	15%	15%	15%	15%	15%	5%		
11	12	5%	15%	15%	15%	15%	15%	5%		
12	13	5%	15%	15%	15%	15%	15%	5%		
13	14	5%	15%	15%	15%	15%	15%	5%		
14	15	5%	15%	15%	15%	15%	15%	5%		
15	16	5%	15%	15%	15%	15%	15%	5%		
16	17	5%	10%	10%	10%	10%	10%	5%		
17	18	5%	5%	5%	5%	5%	5%	5%		
18	19	5%	5%	5%	5%	5%	5%	5%		
19	20	5%	5%	5%	5%	5%	5%	5%		
20	21	5%	5%	5%	5%	5%	5%	5%		
21	22	5%	5%	5%	5%	5%	5%	5%		
22	23	5%	5%	5%	5%	5%	5%	5%		
23	24	5%	5%	5%	5%	5%	5%	5%		

Proposed Plug Load Profiles (Percent of Peak Plug Load)

	,,,,,	9		J					
Proposed - A - Weekly Schedule									
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat	
From	То	1	2	3	4	5	6	7	
0	1	50%	50%	50%	50%	50%	50%	50%	
1	2	50%	50%	50%	50%	50%	50%	50%	
2	3	50%	50%	50%	50%	50%	50%	50%	
3	4	50%	50%	50%	50%	50%	50%	50%	
4	5	50%	50%	50%	50%	50%	50%	50%	
5	6	50%	50%	50%	50%	50%	50%	50%	
6	7	50%	50%	50%	50%	50%	50%	50%	
7	8	50%	50%	50%	50%	50%	50%	50%	
8	9	85%	85%	85%	85%	85%	85%	85%	
9	10	95%	95%	95%	95%	95%	95%	95%	
10	11	95%	95%	95%	95%	95%	95%	95%	
11	12	95%	95%	95%	95%	95%	95%	95%	
12	13	80%	80%	80%	80%	80%	80%	80%	
13	14	80%	80%	80%	80%	80%	80%	80%	
14	15	80%	80%	80%	80%	80%	80%	80%	
15	16	70%	70%	70%	70%	70%	70%	70%	
16	17	50%	50%	50%	50%	50%	50%	50%	
17	18	50%	50%	50%	50%	50%	50%	50%	
18	19	50%	50%	50%	50%	50%	50%	50%	
19	20	50%	50%	50%	50%	50%	50%	50%	
20	21	50%	50%	50%	50%	50%	50%	50%	
21	22	50%	50%	50%	50%	50%	50%	50%	
22	23	50%	50%	50%	50%	50%	50%	50%	
23	24	50%	50%	50%	50%	50%	50%	50%	

	Proposed - B - Not Applicable											
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat				
From	То	1	2	3	4	5	6	7				
0	1	5%	5%	5%	5%	5%	5%	5%				
1	2	5%	5%	5%	5%	5%	5%	5%				
2	3	5%	5%	5%	5%	5%	5%	5%				
3	4	5%	5%	5%	5%	5%	5%	5%				
4	5	5%	5%	5%	5%	5%	5%	5%				
5	6	5%	5%	5%	5%	5%	5%	5%				
6	7	5%	5%	5%	5%	5%	5%	5%				
7	8	5%	15%	15%	15%	15%	15%	5%				
8	9	5%	45%	45%	45%	45%	45%	5%				
9	10	5%	50%	50%	50%	50%	50%	5%				
10	11	5%	50%	50%	50%	50%	50%	5%				
11	12	5%	50%	50%	50%	50%	50%	5%				
12	13	5%	45%	45%	45%	45%	45%	5%				
13	14	5%	45%	45%	45%	45%	45%	5%				
14	15	5%	45%	45%	45%	45%	45%	5%				
15	16	5%	25%	25%	25%	25%	25%	5%				
16	17	5%	10%	10%	10%	10%	10%	5%				
17	18	5%	5%	5%	5%	5%	5%	5%				
18	19	5%	5%	5%	5%	5%	5%	5%				
19	20	5%	5%	5%	5%	5%	5%	5%				
20	21	5%	5%	5%	5%	5%	5%	5%				
21	22	5%	5%	5%	5%	5%	5%	5%				
22	23	5%	5%	5%	5%	5%	5%	5%				
23	24	5%	5%	5%	5%	5%	5%	5%				

	Proposed - C - Not Applicable											
Но	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat				
From	To	1	2	3	4	5	6	7				
0	1	5%	5%	5%	5%	5%	5%	5%				
1	2	5%	5%	5%	5%	5%	5%	5%				
2	3	5%	5%	5%	5%	5%	5%	5%				
3	4	5%	5%	5%	5%	5%	5%	5%				
4	5	5%	5%	5%	5%	5%	5%	5%				
5	6	5%	5%	5%	5%	5%	5%	5%				
6	7	5%	5%	5%	5%	5%	5%	5%				
7	8	5%	10%	10%	10%	10%	10%	5%				
8	9	5%	15%	15%	15%	15%	15%	5%				
9	10	5%	15%	15%	15%	15%	15%	5%				
10	11	5%	15%	15%	15%	15%	15%	5%				
11	12	5%	15%	15%	15%	15%	15%	5%				
12	13	5%	15%	15%	15%	15%	15%	5%				
13	14	5%	15%	15%	15%	15%	15%	5%				
14	15	5%	15%	15%	15%	15%	15%	5%				
15	16	5%	15%	15%	15%	15%	15%	5%				
16	17	5%	10%	10%	10%	10%	10%	5%				
17	18	5%	5%	5%	5%	5%	5%	5%				
18	19	5%	5%	5%	5%	5%	5%	5%				
19	20	5%	5%	5%	5%	5%	5%	5%				
20	21	5%	5%	5%	5%	5%	5%	5%				
21	22	5%	5%	5%	5%	5%	5%	5%				
22	23	5%	5%	5%	5%	5%	5%	5%				
23	24	5%	5%	5%	5%	5%	5%	5%				

McK8760 - Calendar

O8 Provide Demand Controlled Ventilation



Calendar

Weekends Highlighted Yellow For Reference Year 1989

Month	1	2	3	4	5	6	7	8	9	10	11	12
Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
2	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
3	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
4	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
5	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
6	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
7	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
8	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
9	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
10	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
11	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
12	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
13	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
14	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
15	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
16	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
17	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
18	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
19	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
20	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
21	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
22	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
23	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
24	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
25	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
26	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
27	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
28	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
29	Α		Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
30	Α		Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
31	Α		Α		Α		Α	Α		Α		Α

Holidays and Observances: (Reference Year 1989)

Jan 1	New Year's Day	May 29	Memorial Day	Oct 31	Halloween
Jan 16	MLK Day	Jul 4	Independence Day	Nov 11	Veterans Day
Feb 20	Presidents' Day	Sep 4	Labor Day	Nov 23	Thanksgiving Day
Mar 26	Easter Sunday	Oct 9	Columbus Day	Dec 25	Christmas Day

Schedules Summary

Scenario	Scenario Title	Total Days/Yr	Total Hrs/Yr	Baseline HVAC On Hrs/Yr	Proposed HVAC On Hrs/Yr
Schedule A	Weekly Schedule	365	8,760	8,760	8,760
Schedule B	Not Applicable	0	0	0	0
Schedule C	Not Applicable	0	0	0	0
-		365	8,760	8,760	8,760

McK8760 - Inputs

O8 Provide Demand Controlled Ventilation



Zone Inputs:

Tag	Variable Description		Units	Baseline	Proposed	Basis
17	Floor Area		ft ²	21,400	21,400	
18	Roof Area		ft ²	7,183	7,183	
I9	Opaque Wall Area		ft ²	7,027	7,027	
I10	Glazing Area	Glazing	ft ²	1,757	1,757	
I12	Roof U-Factor	Roof	BTU/ft ² /°F	0.200	0.200	
I13	Opaque Wall U-Factor	Walls	BTU/ft ² /°F	0.140	0.140	
I14	Glazing U-Factor	Glazing	BTU/ft ² /°F	0.590	0.590	
I15	Glazing Shading Heat Gain Coefficient	Glazing	-	0.900	0.900	
I16	Glazing Solar Gain Bldg Shape Factor		-	0.300	0.300	
I17	Average Space Height (Floor to Ceiling)		ft	9.0	9.0	
I18	Infiltration		ach	0.250	0.250	
I19	Peak Number of Occupants		Qty	20	20	
I20	Sensible Heat Gain Per Person		Btu/h	250	250	
I21	Latent Heat Gain Per Person		Btu/h	200	200	
I22	Peak Lighting Load Power Density		W/ft ²	1.200	1.200	
I23	Peak Plug Load Power Density		W/ft ²	0.300	0.300	
I24	Peak Miscellaneous Load (Electrical)		Watt	0	0	
I25	Miscellaneous Load Located in Conditioned Space		Yes/No	No	No	
I26	HVAC On Cooling Space Temperature Set Point		°F	74.0	74.0	
I27	HVAC Off Cooling Space Temperature Set Point		°F	74.0	74.0	
I28	HVAC On Heating Space Temperature Set Point		°F	71.0	71.0	
I29	HVAC Off Heating Space Temperature Set Point		°F	68.0	68.0	

AHU & Plant Inputs:

Tag	Variable Description			Baseline	Proposed	Basis
I33	AHU Fan Power based on Control Type	Туре	CV	CV		
I34	Maximum AHU CFM		CFM	17,300	17,300	
I35	Minimum AHU CFM (% of Maximum CFM)		%	100.0%	100.0%	
I36	Maximum % Outside Air (Economizer % OSA)		%	100.0%	100.0%	
I37	Minimum % Outside Air (Occupied)		%	34.2%	34.2%	
I38	Minimum % Outside Air (Unoccupied)		%	3.0%	3.0%	
I39	Economizer High Limit Set Point		°F	65.0	65.0	
I40	Demand Controlled Ventilation (For Outside Air Control	ol)	Yes/No	No	Yes	
I41	DCV Airflow Per Person (Based on Space Type)	DCV Tab	CFM/Per	10.00	10.00	
I42	DCV Airflow Per Area (Based on Space Type)	DCV Tab	CFM/ft ²	0.09	0.09	
I43	AHU Fan TSP (At Max CFM)		in w.c.	1.500	1.500	
I44	Fan Efficiency		%	60.0%	60.0%	
I45	Supply Air Temperature @ OAT>	81.0	°F	65	65	
I46	Supply Air Temperature @ OAT>	41.0	°F	75	75	
I47	AHU Cooling Efficiency (EER)		BTU/Watt	10.1	10.1	
I48	Evaporative Cooling Effectiveness		%	0.0%	0.0%	
I49	AHU Cooling Lockout Below		°F	50.0	50.0	
I50	AHU Heating Efficiency or COP @ OAT>	28.0	COP	0.88	0.88	
I51	AHU Heating Efficiency or COP @ OAT>	COP	0.88	0.88		
I52	AHU Heating Energy Source	Type	Natural Gas	Natural Gas		
I53	AHU Heating Lockout Above	°F	75.0	75.0		
I54	Heat Recovery % Effectiveness		%	0.0%	0.0%	

Terminal Devices Inputs (Reheat Coils, VAV Boxes, Baseboard Heaters, etc)

Tag	Variable Description			Baseline	Proposed	Basis
I58	Terminal Devices		Yes/No	Yes	Yes	
I59	Zone Heating Efficiency or COP @ OAT>	60.0	COP	0.88	0.88	
I60	Zone Heating Efficiency or COP @ OAT>	50.0	COP	0.88	0.88	
I61	Heating Energy Source Zone		Туре	Natural Gas	Natural Gas	
I62	Unoccupied Heating Done By		Zone, AHU	Zone Coil	Zone Coil	
I63	SFPMB Terminal Unit Power		W/CFM	0.00	0.00	

Domestic Hot Water Inputs:

Tag	Variable Description	Units	Baseline	Proposed	Basis
I67	DHW Fuel Type	Type	Natural Gas	Natural Gas	
I68	Energy Factor	-	0.82	0.82	
I69	Working Days Per Year (Used Only For DHW Calc)	Qty	180	180	
I70	Average Daily Hot Water Consumption Per Person	Gallons	1.0	1.0	
I71	Average Entering Cold Water Temperature	°F	50.0	50.0	
I72	Supply Hot Water Temperature	°F	120.0	120.0	

McK8760 - Outputs

08 Provide Demand Controlled Ventilation



Electric Demand

Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
07	Cooling Peak kW (Month = 7)	kW	32	-	25	-	7	-
08	AHU Heating Peak kW (Month = 3)	kW	0	-	0	-	0	-
09	Zone Heating Peak kW (Month = 1)	kW	0	-	0	-	0	-
010	Fan Peak kW	kW	5	-	5	-	0	-
011	Lights Peak kW	kW	24	-	24	-	0	-
012	Plug Load Peak kW	kW	6	-	6	-	0	-
013	Miscellaneous Load Peak kW	kW	0		0	-	0	-
014	Other Peak kW	kW	0	-	0	-	0	-
015	Peak kW (Month = 7)	kW	62	-	55	-	7	-
016	Peak kW (Sum 12 Monthly Peaks)	kW	549	-	530	-	19	-

Electricity

Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
020	Cooling	kWh/Yr	13,007	2.07	12,448	1.99	559	0.09
021	AHU Heating	kWh/Yr	0	0.00	0	0.00	0	0.00
022	Zone Heating	kWh/Yr	0	0.00	0	0.00	0	0.00
023	AHU Fans	kWh/Yr	44,552	7.11	44,552	7.11	0	0.00
024	Zone Fans	kWh/Yr	0	0.00	0	0.00	0	0.00
025	Lights	kWh/Yr	105,197	16.78	105,197	16.78	0	0.00
026	Plug Loads	kWh/Yr	34,681	5.53	34,681	5.53	0	0.00
027	Miscellaneous Loads	kWh/Yr	0	0.00	0	0.00	0	0.00
028	Domestic Hot Water	kWh/Yr	0	0.00	0	0.00	0	0.00
029	Other Electricity	kWh/Yr	0	0.00	0	0.00	0	0.00
030	Total	kWh/Yr	197,436	31.49	196,877	31.40	559	0.09

Natural Gas

Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
034	AHU Heating	Therm/Yr	14,601	68.23	6,793	31.75	7,807	36.48
035	Zone Heating	Therm/Yr	1,802	8.42	2,005	9.37	-204	-0.95
036	Domestic Hot Water	Therm/Yr	26	0.12	26	0.12	0	0.00
037	Other Natural Gas	Therm/Yr	0	0.00	0	0.00	0	0.00
038	Total	Therm/Yr	16,428	76.77	8,824	41.24	7,604	35.53

Steam

Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
042	AHU Heating	kLB/Yr	0	0.00	0	0.00	0	0.00
043	Zone Heating	kLB/Yr	0	0.00	0	0.00	0	0.00
044	Domestic Hot Water	kLB/Yr	0	0.00	0	0.00	0	0.00
045	Other Steam	kLB/Yr	0	0.00	0	0.00	0	0.00
046	Total Steam	kLB/Yr	0	0.00	0	0.00	0	0.00

Total Energy

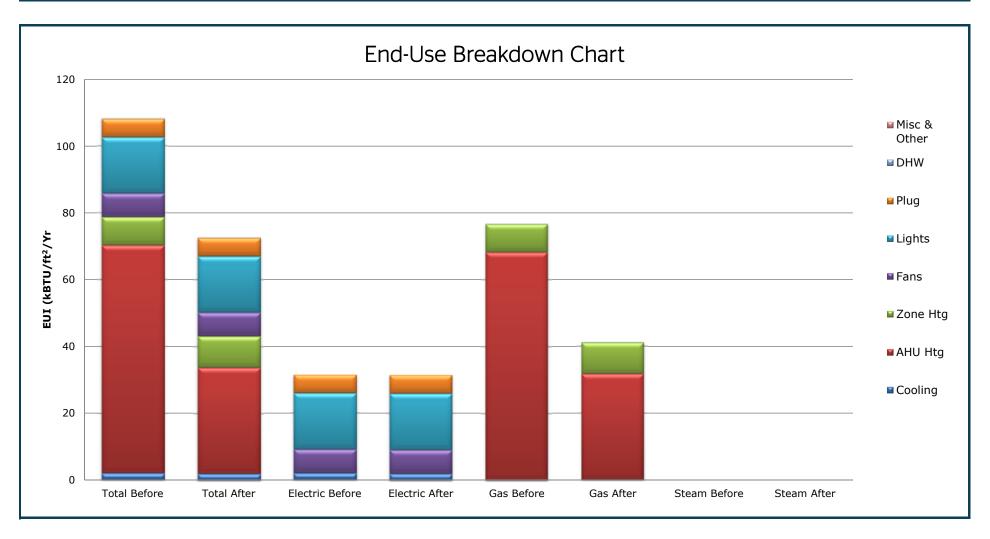
Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
050	Total Energy	kBtu/Yr	2,316,693	108.26	1,554,391	72.64	762,301	35.62

McK8760 - End-Use Breakdown

O8 Provide Demand Controlled Ventilation



EUI By Category	Cooling	AHU Htg	Zone Htg	Fans	Lights	Plug	DHW	Misc & Other	Total
Total Before	2.07	68.23	8.42	7.11	16.78	5.53	0.12	0.00	108.26
Total After	1.99	31.75	9.37	7.11	16.78	5.53	0.12	0.00	72.64
Electric Before	2.07	0.00	0.00	7.11	16.78	5.53	0.00	0.00	31.49
Electric After	1.99	0.00	0.00	7.11	16.78	5.53	0.00	0.00	31.40
Gas Before	0.00	68.23	8.42	0.00	0.00	0.00	0.12	0.00	76.77
Gas After	0.00	31.75	9.37	0.00	0.00	0.00	0.12	0.00	41.24
Steam Before	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Steam After	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

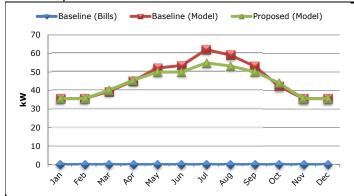


McK8760 - Model Tuning Charts

O8 Provide Demand Controlled Ventilation



Electricity Demand

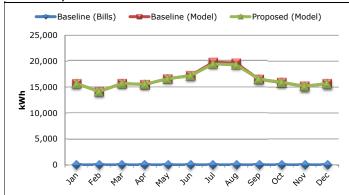


Month	Baseline (Bills)	Baseline (Model)	Proposed (Model)			
Jan	0	36	36			
Feb	0	36	36			
Mar	0	39	40			
Apr	0	45	46			
May	0	52	50			
Jun	0	54	50			
Jul	0	62	55			
Aug	0	59	53			
Sep	0	53	50			
Oct	0	42	44			
Nov	0	36	36			
Dec	0	36	36			
Total	0	549	530			
% Delta Retween Ras	% Delta Between Raceline (Rills) & Raceline (Model) 100%					

% Delta Between Baseline (Bills) & Baseline (Model) RSQ (Correlation Coefficient)

100% #DIV/0!

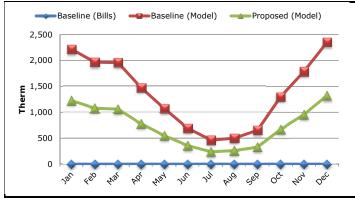
Electricity



Month	Baseline (Bills)	Baseline (Model)	Proposed (Model)
Jan	0	15,660	15,660
Feb	0	14,147	14,147
Mar	0	15,691	15,696
Apr	0	15,497	15,542
May	0	16,622	16,636
Jun	0	17,200	17,165
Jul	0	19,793	19,479
Aug	0	19,634	19,269
Sep	0	16,483	16,521
Oct	0	15,887	15,937
Nov	0	15,159	15,159
Dec	0	15,665	15,665
Total	0	197,436	196,877

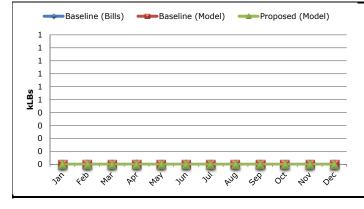
% Delta Between Baseline (Bills) & Baseline (Model) RSQ (Correlation Coefficient) 100% #DIV/0!

Natural Gas



Month	Baseline (Bills)	Baseline (Model)	Proposed (Model)		
Jan	0	2,216	1,225		
Feb	0	1,966	1,079		
Mar	0	1,959	1,059		
Apr	0	1,471	777		
May	0	1,070	550		
Jun	0	693	358		
Jul	0	463	237		
Aug	0	500	261		
Sep	0	653	325		
Oct	0	1,299	672		
Nov	0	1,785	957		
Dec	0	2,354	1,323		
Total	0	16,428	8,824		
0/ 5 !! 5 !	100%				
	% Delta Between Baseline (Bills) & Baseline (Model)				
RSQ (Correlation Co		#DIV/0!			

Steam



Month	Baseline (Bills)	Baseline (Model)	Proposed (Model)
Jan	0	0	0
Feb	0	0	0
Mar	0	0	0
Apr	0	0	0
May	0	0	0
Jun	0	0	0
Jul	0	0	0
Aug	0	0	0
Sep	0	0	0
Oct	0	0	0
Nov	0	0	0
Dec	0	0	0
Total	0	0	0

% Delta Between Baseline (Bills) & Baseline (Model)	#DIV/0!
RSQ (Correlation Coefficient)	#DIV/0!

Facility Improvement Measure (FIM) Detail

Project	WA Governor's Residence	
Scenario	FINAL	
Date	December 2, 2013	



FIM ID	20169	Facility	WA Governors Mansion
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FIM Name 09.01 Interior Lighting Upgrade

FIM Description

The intent of this measure is to replace all incandescent lamps with LED equivalent lamps and upgrade old linear fluorescent fixtures.

Existing: The existing fixtures use traditional incandescent lamps in a variety of fixture types. These lamps consume higher energy, are inefficient at converting energy into light, and have a lower life expectancy than modern lamp technologies. Additionally, there are several fixtures with older technology linear fluorescent lamps which consume more energy than newer types.

Proposed: Replace each incandescent lamp with an LED equivalent and maintain the existing fixture. Lighting controls will remain. The T12 linear fluorescent fixtures shall be retrofitted to T8 lamps and electronic ballasts. Replace T12 undercabinet lighting in the 2nd Floor Kitchen with LED replacements. All existing compact fluorescent 2 and 4-pin connection types will remain.

Benefits: LED lighting provides improved efficacy, efficiency, and operational life compared to traditional incandescent lamp types. New, lower wattage T8 linear fluorescent fixtures will produce improved light quality compared to the existing T12, while saving energy.

Savings Methodology

Electrical energy savings is calculated by comparing existing lighting fixture wattage, ballast efficiency, and burn hours against those of the proposed lighting fixtures and ballasts. Operation and maintenance savings is calculated by comparing the operational life and fixture costs of the existing lighting fixtures versus those of the proposed lighting fixtures.

Utility Savings			
Utility Type	Utility Unit	Quantity Savings	Dollar Savings
Electricity	kWh	17,516	\$1,007
Electric Demand	kW	103	\$380
Natural Gas	Therm	-59	(\$34)
Water	kgal	0	\$0
Sewer	kgal	0	\$0
Total			\$1,352

Confidential & Proprietary

Facility Improvement Measure (FIM) Detail

Project	WA Governor's Residence
Scenario	FINAL
Date	December 2, 2013



FIM ID	21015	Facility	WA Governors Mansion
•			

FIM Name 09.02 Exterior Lighting Upgrades

FIM Description

The intent of this measure is to upgrade existing HID lighting with LED equivalent alternatives.

Existing: There are several variations of both high pressure sodium and incandescent fixtures that serve the exterior grounds and driveway. Each area of the campus lighting is controlled by either a timeclock or Metasys controls system depending on the location.

Proposed: Perform a one-for one LED retrofit or replacement of the selected fixture as indicated within the Lighting Spreadsheet. Lighting Controls scheme will remain.

Benefits: LED lighting provides improved efficacy, efficiency, and operational life compared to traditional HID lamp types.

Savings Methodology

Electrical energy savings is calculated by comparing existing lighting fixture wattage, ballast efficiency, and burn hours against those of the proposed lighting fixtures and ballasts. Operation and maintenance savings is calculated by comparing the operational life and fixture costs of the existing lighting fixtures versus those of the proposed lighting fixtures.

Utility Savings			
Utility Type	Utility Unit	Quantity Savings	Dollar Savings
Electricity	kWh	11,158	\$641
Electric Demand	kW	37	\$137
Natural Gas	Therm	-39	(\$22)
Water	kgal	0	\$0
Sewer	kgal	0	\$0
Total			\$756

Confidential & Proprietary



								Existing						Propose	ed				
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D E	Building Name	Floor/General Area	Room Name	Existing Fixture	Time Code Switching	Fixture Type	Lamp & Ballast Type	Description	# of Fixtures		Operating Hours	Fixture Code	Description	# of Fixtures	Watts per Fixture	# of Lamps	Occ Sensor Type	# of Sensors	Operating Hours
	09.01-GOV Interior lighting Upgrade		1 Foyer 100	F1	710 \$D	Track	50PAR01	Track / Incandescent, PAR lamp / N/A	2	50	3650	LED-PAR38 18W	LED PAR38 screw-in lamp 18W		2 20	2			365
	9.01-GOV Interior ighting Upgrade		1 Foyer 100	F2	710 \$D	Decretive Pendant	15BA03	Decretive Pendant / Incandescent, BA lamp / N/A	1	45	3650	LED-Candelabra 5W	LED Candelabra pointed tip screw-in lamp 5W	:	3 5	3			365
	09.01-GOV Interior ighting Upgrade		1 Coat Rm 102	F4	702 \$	Decretive Celing	60A03	Decretive Celing / Incandescent, A lamp / N/A	1	180	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	:	3 10	3			73
	09.01-GOV Interior ighting Upgrade		1 Entry Hall 103	F2	710 \$	Decretive Pendant	15BA03	Decretive Pendant / Incandescent, BA lamp / N/A	3	45	3650	LED-Candelabra 5W	LED Candelabra pointed tip screw-in lamp 5W		9 5	9			365
	09.01-GOV Interior Lighting Upgrade		1 Entry Hall 103	F5	702 \$	Desk	15BA04	Desk / Incandescent, BA lamp / N/A	2	60	730	LED-Candelabra 5W	LED Candelabra pointed tip screw-in lamp 5W		8 5	8			73
	09.01-GOV Interior lighting Upgrade		1 Ballroom 104	F6	704 \$D	Chandelier	15BA12	Chandelier / Incandescent, BA lamp / N/A	3	180	1460	LED-Candelabra 5W	LED Candelabra pointed tip screw-in lamp 5W	3:	6 5	36			1460
	09.01-GOV Interior Lighting Upgrade		1 Ballroom 104	F7	704 \$D	Chandelier	15BA04	Chandelier / Incandescent, BA lamp / N/A	8	60	1460	LED-Candelabra 5W	LED Candelabra pointed tip screw-in lamp 5W	3:	2 5	32			146
	09.01-GOV Interior Lighting Upgrade		1 Dinning Rm 105	F8	704 \$D	Downlights	35MR16	Downlights / Halogen, MR16 / N/A	8	35	1460	LED-MR16 10W	LED MR16 2-pin lamp 10W		8 10	8			1460
c	09.01-GOV Interior lighting Upgrade		1 Dinning Rm 105	F9	704 \$D	Chandelier	15BA05	Chandelier / Incandescent, BA lamp / N/A	1	75	1460	LED-Candelabra 5W	LED Candelabra pointed tip screw-in lamp 5W		5 5	5			1460
c	09.01-GOV Interior lighting Upgrade		1 Sun Rm 107	F10	704 \$D	Chandelier	40A04	Chandelier / Incandescent, A lamp / N/A	1	160	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W		1 10	1			1460
c	09.01-GOV Interior lighting Upgrade		1 Sun Rm 107	F11. Also has 3Way \$	704 \$D	Downlights	40A01	Downlights / Incandescent, A lamp / N/A	6	40	1460	LED-PAR20 11W	LED PAR20 screw-in lamp 11W		6 10	6			1460
c	09.01-GOV Interior lighting Upgrade		1 Sun Rm 107	F12. Also has 3Way \$	704 \$D	Spot	50AR01	Spot / Incandescent, PAR lamp / N/A	2	50	1460	LED-PAR20 11W	LED PAR20 screw-in lamp 11W		2 10	2			1466
14 L	09.01-GOV Interior Lighting Upgrade		1 Sun Rm 107	F13	704 \$D	Downlights	75PAR01	Downlights / Incandescent, PAR lamp / N/A	2	75	1460	LED-PAR38 18W	LED PAR38 screw-in lamp 18W	:	2 20	2			1460
	09.01-GOV Interior ighting Upgrade		1 Breeze Way 108	F14	704 \$D	Track	35MR16	Track / Halogen, MR16 / N/A	2	35	1460	LED-MR16 10W	LED MR16 2-pin lamp 10W	:	2 10	2			1460
	09.01-GOV Interior Lighting Upgrade		1 Breeze Way 108	F11	704 S	Downlights	40A01	Downlights / Incandescent, A lamp / N/A	1	40	1460	LED-PAR20 11W	LED PAR20 screw-in lamp 11W		1 10	1			1460
17 L	09.01-GOV Interior ighting Upgrade		1 Entry 109	F15	704 S	Downlights	60A01	Downlights / Incandescent, A lamp / N/A	2	60	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	:	2 10	2			146
	09.01-GOV Interior ighting Upgrade		1 RR 111	F16	704 S	Sconce	15CFL01	Sconce / 15W CFL / N/A	3	16	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W		3 10	3			1460
	09.01-GOV Interior lighting Upgrade		1 RR 111	F15	704 \$	Downlights	60A01	Downlights / Incandescent, A lamp / N/A	1	60	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W		1 10	1			1460
	09.01-GOV Interior Lighting Upgrade		1 Office 110	F15	704 \$	Downlights	60A01	Downlights / Incandescent, A lamp / N/A	1	60	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W		1 10	1			1460
	09.01-GOV Interior ighting Upgrade		1 Hall 110A	F15	710 S	Downlights	60A01	Downlights / Incandescent, A lamp / N/A	1	60	3650	LED-ALAMP 10W	LED A19 screw-in lamp 10W		1 10	1			3650
	09.01-GOV Interior Lighting Upgrade		1 Kitchen 106	F17 F18. on 2 dimmers.	704 S	1X4 Priz	32T802E	1X4 Priz / 32W Fluorescent, 4'-0" T8 / Electronic, T8	10	63	1460	EB2LN/28	Lamp & Ballast retrofit, (2) 28W T8 & normal ballast factor electronic ballast.	10	0 42	20			1460
23 L	09.01-GOV Interior ighting Upgrade		1 Hallway 112	1 fixture with 11 heads	710 \$D	Track	75PAR01	Track / Incandescent, PAR lamp / N/A	11	75	3650	LED-PAR38 18W	LED PAR38 screw-in lamp 18W	1	1 20	11			365
	09.01-GOV Interior lighting Upgrade		1 Hallway 112	F11	710 \$D	Downlights	40A01	Downlights / Incandescent, A lamp / N/A	6	40	3650	LED-PAR20 11W	LED PAR20 screw-in lamp 11W		6 10	6			365
	09.01-GOV Interior lighting Upgrade		1 Porior 113	F19. each side on separate dimmer.	704 \$D	Indirect	40A01	Indirect / Incandescent, A lamp / N/A	32	40	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	3:	2 10	32			1460
	09.01-GOV Interior Lighting Upgrade		1 Hallway	F20	710 \$	Track	35MR16	Track / Halogen, MR16 / N/A	1	35	3650	LED-MR16 10W	LED MR16 2-pin lamp 10W		1 10	1			365
	09.01-GOV Interior Lighting Upgrade		1 Hallway	F21	710 \$	Down/Spot	35MR16	Down/Spot / Halogen, MR16 / N/A	6	35	3650	LED-MR16 10W	LED MR16 2-pin lamp 10W		6 10	6			365
	09.01-GOV Interior lighting Upgrade		1 Women's 118	F22	704 \$	Chandelier	15BA03	Chandelier / Incandescent, BA lamp / N/A	1	45	1460	LED-Candelabra 5W	LED Candelabra pointed tip screw-in lamp 5W		3 5	3			146



								Existing						Propose	ed				
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ID	Building Name	Floor/General Area	Room Name	Existing Fixture	Time Code Switching	Fixture Type	Lamp & Ballast Type	Description	# of Fixtures		Operating Hours	Fixture Code	Description	# of Fixtures	Watts per Fixture	# of Lamps	Occ Sensor Type	# of Sensors	Operating Hours
	09.01-GOV Interior Lighting Upgrade		1 Women's 118	F23	704 \$3	Sconce	40A01	Sconce / Incandescent. A lamp / N/A	2	40	1460	LED-PAR20 11W	LED PAR20 screw-in lamp 11W		2 10				1460
	09.01-GOV Interior																		
	Lighting Upgrade 09.01-GOV Interior		1 Women's 118	F24	704 \$3	Downlights	50PAR01	Downlights / Incandescent, PAR lamp / N/A	2	50	1460	LED-PAR38 18W	LED PAR38 screw-in lamp 18W	:	2 20	:	2		1460
	Lighting Upgrade		1 Women's 118	F15	704 \$3	Downlights	60A01	Downlights / Incandescent, A lamp / N/A	1	60	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W		1 10				1460
	09.01-GOV Interior Lighting Upgrade		1 Closet	F25	704 \$	General	60A01	General / Incandescent, A lamp / N/A	1	60	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W		1 10				1460
	09.01-GOV Interior Lighting Upgrade		1 Stair Hall 116	F26. 1 is on 3Way switch.	708 \$	General	60A01	General / Incandescent, A lamp / N/A	2	60	2920	LED-ALAMP 10W	LED A19 screw-in lamp 10W		2 10		2		2920
	09.01-GOV Interior		1 Sitting Rm 115	F27	704 \$	Chandelier	15BA06	Chandelier / Incandescent. BA lamp / N/A		90	1460	LED-Candelabra	LED Candelabra pointed tip screw-in		4				1460
	Lighting Upgrade 09.01-GOV Interior		1 Sitting Rm 115	F27	704 \$	Chandeller	15BAU6	Chandeller / Incandescent, BA lamp / N/A		91	1460	SW	lamp 5W		5				1460
35	Lighting Upgrade		1 Sitting Rm 115	F21	704 \$D	Down/Spot	35MR16	Down/Spot / Halogen, MR16 / N/A	1	3!	1460	LED-MR16 10W	LED MR16 2-pin lamp 10W		1 10	-			1460
	09.01-GOV Interior Lighting Upgrade		1 Library 114	F28	704 \$D	Chandelier	15BA08	Chandelier / Incandescent, BA lamp / N/A	1	120	1460	LED-Candelabra 5W	LED Candelabra pointed tip screw-in lamp 5W		8 5	8	3		1460
	09.01-GOV Interior Lighting Upgrade		R1	F21	704 s	Down/Spot	35MR16	Down/Spot / Halogen, MR16 / N/A	1	3!	1460	LED-MR16 10W	LED MR16 2-pin lamp 10W		1 10		ı		1460
	09.01-GOV Interior Lighting Upgrade		R1	F11	704 S	Downlights	40A01	Downlights / Incandescent, A lamp / N/A	3	40	1460	LED-PAR20 11W	LED PAR20 screw-in lamp 11W		3 10				1460
	09.01-GOV Interior			Ī															
	Lighting Upgrade 09.01-GOV Interior		3 Bedroom 306	F29	704 \$	General	60A01	General / Incandescent, A lamp / N/A	,	60	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W		1 10				1460
40	Lighting Upgrade		3 Closet	F30	701 S	General	60A01	General / Incandescent, A lamp / N/A	1	60	365	LED-ALAMP 10W	LED A19 screw-in lamp 10W		1 10				365
	09.01-GOV Interior Lighting Upgrade		3 Office 308	F29	705 \$	General	60A01	General / Incandescent, A lamp / N/A	1	64	1825	LED-ALAMP 10W	LED A19 screw-in lamp 10W		1 10				1825
	09.01-GOV Interior Lighting Upgrade		3 Closet 307	F30	701 \$	General	60A01	General / Incandescent, A lamp / N/A	1	60	365	LED-ALAMP 10W	LED A19 screw-in lamp 10W		1 10				365
	09.01-GOV Interior Lighting Upgrade		3 Storage 309	F31	724 \$	General	18CFL01	General / Compact Fluorescent, 18W PL / N/A	1	11	8760	LED-ALAMP 10W	LED A19 screw-in lamp 10W		1 10				8760
	09.01-GOV Interior		2 Kitchen 208	F39	724 S	General	100A01	General / Incandescent. A lamp / N/A		100	07/0		LED A19 screw-in lamp 10W		2 10				8760
	Lighting Upgrade 09.01-GOV Interior							Under Cabinet / 20W Fluorescent, 2'-0" T12	,	2 100		LED-Undercabinet			2 10		4		
	Lighting Upgrade 09.01-GOV Interior		2 Kitchen 208	F41	705 \$	Under Cabine	20T1201M	Standard Magnetic, T12	2	2	1825	7W	LED Undercabinet Fixture 7W	:	2 7	:	2		1825
	Lighting Upgrade		2 RR 207	F42	704 S	Vanity	60A03	Vanity / Incandescent, A lamp / N/A	1	180	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	:	3 10	3	8		1460
	09.01-GOV Interior Lighting Upgrade		2 Patio	F43	702 \$	Sconce	18CFL01	Sconce / Compact Fluorescent, 18W PL / N/A	2	11	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	:	2 10	:	2		730
	09.01-GOV Interior Lighting Upgrade		2 Family Rm 205	F21	705 \$D	Down/Spot	35MR16	Down/Spot / Halogen, MR16 / N/A	2	3!	1825	LED-MR16 10W	LED MR16 2-pin lamp 10W		2 10	:	2		1825
	09.01-GOV Interior Lighting Upgrade		2 Hall 201	F21	710 SD	Down/Spot	35MR16	Down/Spot / Halogen, MR16 / N/A		3!	3650	LED-MR16 10W	LED MR16 2-pin lamp 10W		3 10				3650
	09.01-GOV Interior																		
	Lighting Upgrade 09.01-GOV Interior		2 Hall 201	F8	710 \$3	Downlights	35MR16	Downlights / Halogen, MR16 / N/A	9	3!	3650	LED-MR16 10W	LED MR16 2-pin lamp 10W		9 10				3650
56	Lighting Upgrade		2 Master Bed 202	F21	704 \$	Down/Spot	35MR16	Down/Spot / Halogen, MR16 / N/A	1	3!	1460	LED-MR16 10W	LED MR16 2-pin lamp 10W		1 10	-			1460
	09.01-GOV Interior Lighting Upgrade		2 Bathroom 204	F45	702 \$	Vanity	60A01	Vanity / Incandescent, A lamp / N/A	4	66	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W		4 10				730
	09.01-GOV Interior Lighting Upgrade		2 Shower 204B	F46	702 \$	Water Vapor	60A01	Water Vapor / Incandescent, A lamp / N/A	1	64	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W		1 10				730
	09.01-GOV Interior Lighting Upgrade		2 Toilet 204C	F45	702 \$	Vanity	30A01	Vanity / Incandescent, A lamp / N/A	1	3(730	I FD-ALAMP 10W	LED A19 screw-in lamp 10W		1 10				730
	09.01-GOV Interior					Decretive		Decretive General / Incandescent, A lamp /							10				
64	Lighting Upgrade		2 Hall 218	F47	710 \$	General	60A02	N/A	1	120	3650	LED-ALAMP 10W	LED A19 screw-in lamp 10W		2 10	:	2		3650



									Existing						Propose	d				
ID E	Building Name	Floor/General Area	Room Name	Existing Fixture	Time Code	Switching	Fixture Type	Lamp & Ballast Type	Description	# of Fixtures		Operating Hours	Fixture Code	Description	# of Fixtures	Watts per Fixture	# of Lamps	Occ Sensor Type	# of Sensors	Operating Hours
65 L	09.01-GOV Interior Lighting Upgrade		2 Bedroom 219	F48	70-	1 S	Chandelier	15BA05	Chandelier / Incandescent, BA lamp / N/A	1	7!	5 1460	LED-Candelabra 5W	LED Candelabra pointed tip screw-in lamp 5W		5 5	5 5			1460
	09.01-GOV Interior Lighting Upgrade		2 Bedroom 219	F49	70-	1 S	Sconce	15BA02	Sconce / Incandescent, BA lamp / N/A	2	30	0 1460	LED-Candelabra 5W	LED Candelabra pointed tip screw-in lamp 5W	4	1 5	; .			1460
	09.01-GOV Interior Lighting Upgrade		2 Closet	F50	70:	2 S	General	60A01	General / Incandescent, A lamp / N/A	1	60	0 730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10				730
68 L	09.01-GOV Interior Lighting Upgrade		2 Bedroom 217	F47	70-	1 S	Decretive General	60A02	Decretive General / Incandescent, A lamp / N/A	1	120	0 1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	2	2 10				1460
	09.01-GOV Interior Lighting Upgrade		2 Closet	F50	70:	2 S	General	60A01	General / Incandescent, A lamp / N/A	1	60	0 730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10				730
70 L	09.01-GOV Interior Lighting Upgrade		2 Bedroom 216	F47	70-	ı s	Decretive General	60A02	Decretive General / Incandescent, A lamp / N/A	1	120	0 1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	2	2 10) :			1460
	09.01-GOV Interior Lighting Upgrade		2 Closet	F50	70:	2 S	General	60A01	General / Incandescent, A lamp / N/A	1	60	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	1 10				730
	09.01-GOV Interior Lighting Upgrade		2 Bathroom 220	F51	70-	1 S	Vanity	34T1201ES	Vanity / 34W Fluorescent, 4'-0" T12 / Energy Savings Magnetic, T12	1	4:	3 1460	EB1LN	Lamp & Ballast retrofit, (1) 32W T8 & normal ballast factor electronic ballast.	1	1 28				1460
	09.01-GOV Interior Lighting Upgrade		2 Bedroom 215	F11	70-	1 S	Downlights	40A01	Downlights / Incandescent, A lamp / N/A	3	40	0 1460	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	3	3 10				1460
	09.01-GOV Interior Lighting Upgrade		2 Bathroom 214	F51	70-	1 S	Vanity	60A04	Vanity / Incandescent, A lamp / N/A	1	240	0 1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	4	1 10				1460
	09.01-GOV Interior Lighting Upgrade		2 Bathroom 214	F11	70-	ı s	Downlights	40A01	Downlights / Incandescent, A lamp / N/A	1	40	0 1460	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	1	10				1460
77 L	09.01-GOV Interior Lighting Upgrade	:	2 Bathroom 213	F51	70-	ı s	Vanity	60A04	Vanity / Incandescent, A lamp / N/A	1	240	0 1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	4	1 10				1460
78 L	09.01-GOV Interior Lighting Upgrade	:	2 Bathroom 213	F11	70	ı s	Downlights	40A01	Downlights / Incandescent, A lamp / N/A	1	40	0 1460	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	1	10				1460
	09.01-GOV Interior Lighting Upgrade		2 Bedroom 212	F11	70-	1 S	Downlights	40A01	Downlights / Incandescent, A lamp / N/A	3	40	0 1460	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	3	3 10) 3			1460
80 L	09.01-GOV Interior Lighting Upgrade		2 Hall 211	F11	710	s	Downlights	40A01	Downlights / Incandescent, A lamp / N/A	6	40	3650	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	é	10	0 6			3650
81 L	09.01-GOV Interior Lighting Upgrade		2 Hall 211	F52	711	s	Scallop	40A01	Scallop / Incandescent, A lamp / N/A	2	40	3650	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	2	2 10	2			3650
82 L	09.01-GOV Interior Lighting Upgrade		2 Hall 200	F11	711	s	Downlights	40A01	Downlights / Incandescent, A lamp / N/A	6	40	3650	LED-PAR20 11W	LED PAR20 screw-in lamp 11W		10) (3650
83 L	09.01-GOV Interior Lighting Upgrade	:	2 Hall 200	F53	711	s	Down/Spot	35MR16	Down/Spot / Halogen, MR16 / N/A	2	3!	5 3650	LED-MR16 10W	LED MR16 2-pin lamp 10W	2	2 10	2			3650
84 L	09.01-GOV Interior Lighting Upgrade		2 Balcony	F54	70:	2 \$	General	60A03	General / Incandescent, A lamp / N/A	1	180	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	3	3 10				730
85 L	09.01-GOV Interior Lighting Upgrade		2 Hall Stair	F8	711	s	Downlights	35MR16	Downlights / Halogen, MR16 / N/A	1	3!	3650	LED-MR16 10W	LED MR16 2-pin lamp 10W	1	1 10				3650
86 L	09.01-GOV Interior Lighting Upgrade		3 Family Rm 300	F32	70-	1 S	Decretive General	60A03	Decretive General / Incandescent, A lamp / N/A	3	180	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	3	3 10	3			1460
87 L	09.01-GOV Interior Lighting Upgrade		3 Bathroom 303	F33	70-	1 S	Vanity	60A02	Vanity / Incandescent, A lamp / N/A	1	120	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	2	2 10				1460
88 L	09.01-GOV Interior Lighting Upgrade		3 Bedroom 302	F29	70-	1 S	General	60A01	General / Incandescent, A lamp / N/A	1	66	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10				1460
89 L	09.01-GOV Interior Lighting Upgrade		3 Closet	F30	70:	2 S	General	60A01	General / Incandescent, A lamp / N/A	1	60	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10				730
90 L	09.01-GOV Interior Lighting Upgrade		3 Attic 301	F25	70:	2 S	General	60A01	General / Incandescent, A lamp / N/A	3	60	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	3	3 10				730
91 L	09.01-GOV Interior Lighting Upgrade		3 3rd Stair Hall	F25	70	3 S	General	60A01	General / Incandescent, A lamp / N/A	1	60	2920	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10				2920
	09.01-GOV Interior Lighting Upgrade		2 2nd Stair Hall	F25	70	\$3	General	60A01	General / Incandescent, A lamp / N/A	2	60	0 2920	LED-ALAMP 10W	LED A19 screw-in lamp 10W	2	2 10				2920



									Existing						Propose	d				
ID	Building Name	Floor/General Area	Room Name	Existing Fixture	Time Code	Switching	Fixture Type	Lamp & Ballast Type	Description	# of Fixtures	Watts per (Operating Hours	Fixture Code	Description	# of Fixtures	Watts per Fixture	# of Lamps	Occ Sensor Type	# of Sensors	Operating Hours
	09.01-GOV Interior Lighting Upgrade		Stairs	F15	708	63	Downlights	60A01	Downlights / Incandescent, A lamp / N/A	2	60	2920	LED-ALAMP 10W	LED A19 screw-in lamp 10W		10				2920
	09.01-GOV Interior																			
	Lighting Upgrade 09.01-GOV Interior	E	Conf Rm 014	F35	705	S	General	60A02	General / Incandescent, A lamp / N/A	3	120	1825	LED-ALAMP 10W	LED A19 screw-in lamp 10W	6	10	6			1825
96	Lighting Upgrade	E	Safe	F25	701	s	General	60A01	General / Incandescent, A lamp / N/A	1	60	365	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1			365
	09.01-GOV Interior Lighting Upgrade	E	Conf Rm Bar	F36	705	s	Downlights	40A01	Downlights / Incandescent, A lamp / N/A	2	40	1825	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	2	10	2			1825
	09.01-GOV Interior Lighting Upgrade	E	Hallway 013	F15. No Switch?	710		Downlights	60A01	Downlights / Incandescent, A lamp / N/A	1	60	3650	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	OCS (Wall Switch)	1	2555
	09.01-GOV Interior Lighting Upgrade	E	Hallway 013	F37	710	s	Industrial	30T1202M	Industrial / 30W Fluorescent, 3'-0" T12 / Standard Magnetic, T12	1	79	3650	IND4-2	4'-0" Industrial with white reflector, (2) 32W T8 and EB2L electronic ballast.	1	55	2	OCS (Wall Switch)	1	2555
100	09.01-GOV Interior Lighting Upgrade		Storage 018	F15	701	s	Downlights	60A01	Downlights / Incandescent, A lamp / N/A	2	60	365	LED-ALAMP 10W	LED A19 screw-in lamp 10W	2	10	2			365
	09.01-GOV Interior																			
	Lighting Upgrade 09.01-GOV Interior	E	RR 017	F38	704	S	Vanity	75A02	Vanity / Incandescent, A lamp / N/A	1	150	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1			1460
	Lighting Upgrade 09.01-GOV Interior	E	RR 017		704	S	Downlights	60PAR01	Downlights / Incandescent, PAR lamp / N/A	1	60	1460	LED-PAR38 18W	LED PAR38 screw-in lamp 18W	1	20	1	OCS (Wall		1460
103	Lighting Upgrade	E	Hallway 013	F30	710	s	General	60A01	General / Incandescent, A lamp / N/A	1	60	3650	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	Switch)	1	2920
	09.01-GOV Interior Lighting Upgrade	E	Hallway 010	F15	710	\$3	General	60A01	General / Incandescent, A lamp / N/A	1	60	3650	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	OCS (Wall Switch)	1	2920
105	09.01-GOV Interior Lighting Upgrade	E	Hallway 010	F25	710	\$3	General	60A01	General / Incandescent, A lamp / N/A	1	60	3650	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	OCS (Wall Switch)	1	2920
	09.01-GOV Interior Lighting Upgrade		Storage 019	F25	702	s	General	60A01	General / Incandescent, A lamp / N/A	1	60	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1			730
	09.01-GOV Interior Lighting Upgrade		Laundry 009	F17	705		1X4 Priz	32T802E	1X4 Priz / 32W Fluorescent, 4'-0" T8 / Electronic, T8	3	63	1825	EB2LN/28	Lamp & Ballast retrofit, (2) 28W T8 & normal ballast factor electronic ballast.	,	42				1825
	09.01-GOV Interior															72				
	Lighting Upgrade 09.01-GOV Interior	E	Hallway 007	F15	705	S	Downlights	60A01	Downlights / Incandescent, A lamp / N/A	1	60	1825	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	1	10	1	OCS (Wall		1825
109	Lighting Upgrade	E	Storage 003	F15	705	S	Downlights	60A01	Downlights / Incandescent, A lamp / N/A	1	60	1825	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	1	10	1	Switch)	1	1460
	09.01-GOV Interior Lighting Upgrade	E	Workroom 005	F25	705	s	General	60A01	General / Incandescent, A lamp / N/A	1	60	1825	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	OCS (Wall Switch)	1	1460
	09.01-GOV Interior Lighting Upgrade	E	Workroom 005	F41	705	s	Under Cabinet	20T1201M	Under Cabinet / 20W Fluorescent, 2'-0" T12 / Standard Magnetic, T12	3	24	1825	LED-Undercabinet 7W	LED Undercabinet Fixture 7W	3	7	3			1825
	09.01-GOV Interior Lighting Upgrade	E	Storage 006	F25	702	s	General	60A01	General / Incandescent, A lamp / N/A	1	60	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1			730
	09.01-GOV Interior Lighting Upgrade	E	Storage 002	F25	702	s	General	60A01	General / Incandescent, A lamp / N/A	1	60	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1			730
														New LED Canopy replacement for existing screw in CFL Wall mount.						
114	09.01-GOV Interior Lighting Upgrade	E	Entry 001	F25	702	s	General	42CFL01	General / Compact Fluorescent, 42W Triple / N/A	1	44	730	LED Canopy	Modify conduit from nearest j-box to serve new canopy fixture location.	1	41	1			730
	09.01-GOV Interior Lighting Upgrade	E	Wine Cellar 004	F26	702	s	General	60A01	General / Incandescent, A lamp / N/A	1	60	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1			730
116	09.02-GOV Exterior			F2. Serves Residence, but							0	0	LED-FL LARGE	Flood LED fixture replacement with						
118	Lighting Upgrade 09.02-GOV Exterior	Exterior	N Parking	located outside of	710	ST	Flood	250HPS01	Flood / HPS 250W / HID Magnetic	1	295	3650	163W LED-FL LARGE	163W LED. Integral occupancy sensor.	1	114	1			3650
119	Lighting Upgrade	Exterior	Driveway	F2	710	\$T	Flood	250HPS01	Flood / HPS 250W / HID Magnetic	3	295	3650	163W	Flood LED fixture replacement with 163W LED. Integral occupancy sensor.	3	114	3			3650
	09.02-GOV Exterior Lighting Upgrade	Exterior	Parking	F2	710	\$T	Flood	250HPS01	Flood / HPS 250W / HID Magnetic	3	295	3650	LED-FL LARGE 163W	Flood LED fixture replacement with 163W LED. Integral occupancy sensor.	3	114	3			3650
	09.02-GOV Exterior Lighting Upgrade	Exterior	Carport	F4	710	s	Wet Location	60T1201SLM	Wet Location / 60W Fluorescent, 8'-0" T12, Slimline / Standard Magnetic, T12	4	83	3650	EB4LL	Lamp & Ballast retrofit, (4) 28W T8 & low ballast factor electronic ballast.	4	87	16			3650



									Existing						Propose	ed				
D B	Building Name	Floor/General Area	Room Name	Existing Fixture	Time Code	Switching	Fixture Type	Lamp & Ballast Type	Description	# of Fixtures	Watts per Fixture	Operating Hours	Fixture Code	Description	# of Fixtures	Watts per Fixture	# of Lamps	Occ Sensor Type	# of Sensors	Operatin Hours
	09.02-GOV Exterior Lighting Upgrade	Exterior	West Guard Shack	F8	711	s	Industrial 8'	60T1201SLM	Industrial 8' / 60W Fluorescent, 8'-0" T12, Slimline / Standard Magnetic, T12	1	8:	3650	EB4LL	Lamp & Ballast retrofit, (4) 28W T8 & low ballast factor electronic ballast.		1 87	4			36
	09.02-GOV Exterior Lighting Upgrade	Exterior	Driveway	F2	710	ST	Flood	150HPS01	Flood / HPS 150W / HID Magnetic	2	170	3650	LED-AREA 109W	Area LED fixture replacement with 109W LED. Integral occupancy sensor.		2 76	2			36
	09.02-GOV Exterior Lighting Upgrade	Exterior	Pathway/Security	F2	711	ST ST	Flood	150HPS01	Flood / HPS 150W / HID Magnetic	3	170	3650	LED-AREA 109W	Area LED fixture replacement with 109W LED. Integral occupancy sensor.		3 76	3			36
	09.02-GOV Exterior Lighting Upgrade	Exterior	Pathway/Security	F2	711) ST	Flood	150HPS01	Flood / HPS 150W / HID Magnetic	2	170	3650	LED-AREA 109W	Area LED fixture replacement with 109W LED. Integral occupancy sensor.		2 76	2			36
	09.02-GOV Exterior Lighting Upgrade	Exterior	Southwest Corner	F13	711) ST	Sconce	18CFL01	Sconce / Compact Fluorescent, 18W PL / N/A	1	19	3650	LED-ALAMP 10W	LED A19 screw-in lamp 10W		1 10	1			365
	09.02-GOV Exterior Lighting Upgrade	Exterior	Rear Porchlight	F14	710	ST ST	Flood	60PAR01	Flood / Incandescent, PAR lamp / N/A		. 60	3650	LED-PAR38 18W	LED PAR38 screw-in lamp 18W	:	2 20	2			36
	09.02-GOV Exterior Lighting Upgrade	Exterior	Fountain Lights	F15	710	ST	Grade	60PAR01	Grade / Incandescent, PAR lamp / N/A	2	. 60	3650	LED-PAR38 18W	LED PAR38 screw-in lamp 18W	:	2 20	2			36
	09.02-GOV Exterior ighting Upgrade	Exterior	Southeast Site/Security	F2	711	ST	Flood	150HPS01	Flood / HPS 150W / HID Magnetic		170	3650	LED-AREA 109W	Area LED fixture replacement with 109W LED. Integral occupancy sensor.	:	2 76				36
	09.02-GOV Exterior Lighting Upgrade	Exterior	East Gate/Site	F16. 1 pole, 2 heads	711	ST ST	Shoebox	150HPS01	Shoebox / HPS 150W / HID Magnetic	2	170	3650	LED-AREA 109W	Area LED fixture replacement with 109W LED. Integral occupancy sensor.		2 76	2			365
	09.02-GOV Exterior Lighting Upgrade	Exterior	East Guard Shack Site	F2	711		Flood	250HPS01	Flood / HPS 250W / HID Magnetic	3	29!	3650	LED-FL LARGE 163W	Flood LED fixture replacement with 163W LED. Integral occupancy sensor.		3 114	3			365
	09.02-GOV Exterior Lighting Upgrade	Exterior	Flag Lights	F11	711		Spot	26CFL01	Spot / Compact Fluorescent, 26W Triple / N/A	2	30	3650	LED-PAR20 11W	LED PAR20 screw-in lamp 11W		2 10	2			36
	09.02-GOV Exterior Lighting Upgrade	Exterior	Norh East Pathway/Site Security	F2	711	ST	Flood	250HPS01	Flood / HPS 250W / HID Magnetic	3	29!	3650	LED-FL LARGE 163W	Flood LED fixture replacement with 163W LED. Integral occupancy sensor.	:	3 114	3			36
142 L	09.02-GOV Exterior Lighting Upgrade	Exterior	Northeast Pathway/Site	F16	711	st st	Shoebox	150HPS01	Shoebox / HPS 150W / HID Magnetic	1	170	3650	LED-AREA 109W	Area LED fixture replacement with 109W LED. Integral occupancy sensor.		1 76	1			36
144 Го tal 1										285					399		428			

CONFIDENTIAL AND PROPRIETARY 11/21/2013

Facility Improvement Measure (FIM) Detail

Project	WA Governor's Residence
Scenario	FINAL
Date	December 2, 2013



FIM ID	20175	Facility	WA Governors Mansion

FIM Name 13 Provide Domestic Hot Water Heater

FIM Description

The intent of this measure is to replace the existing domestic water heater with a condensing domestic water heater.

Existing: Domestic water heating is provided by a domestic water storage tank with integral steam heat exchanger.

Proposed: Provide a condensing instantaneous domestic water heater to replace the steam water heater, including, piping, expansion tank, controls, and appurtenances.

Benefits: Domestic water heating energy usage will be reduced through improving the combustion efficiency and reducing standby losses of the domestic water heaters.

Savings Methodology

Annual savings is calculated using a bin calculation calibrated to match the consumption recorded by the steam, electric, and chilled water submeters serving the residence. Baseline heating system efficiency is based on an analysis of the powerhouse steam system standby losses performed in 2006. The proposed heating system efficiency is based on the energy factor of a Navien model NPE-240A tankless gas water heater.

Utility Savings			
Utility Type	Utility Unit	Quantity Savings	Dollar Savings
Electricity	kWh	0	\$0
Electric Demand	kW	0	\$0
Natural Gas	Therm	208	\$118
Water	kgal	0	\$0
Sewer	kgal	0	\$0
Total			\$118

Confidential & Proprietary

McK8760 - Inputs

13 Provide Domestic Hot Water Heater



Zone Inputs:

Tag	Variable Description		Units	Baseline	Proposed	Basis
I7	Floor Area	ft ²	21,400	21,400		
18	Roof Area		ft ²	7,183	7,183	
I9	Opaque Wall Area		ft ²	7,027	7,027	
I10	Glazing Area	Glazing	ft ²	1,757	1,757	
I12	Roof U-Factor	Roof	BTU/ft ² /°F	0.200	0.200	
I13	Opaque Wall U-Factor	Walls	BTU/ft ² /°F	0.140	0.140	
I14	Glazing U-Factor	Glazing	BTU/ft ² /°F	0.590	0.590	
I15	Glazing Shading Heat Gain Coefficient	Glazing	-	0.900	0.900	
I16	Glazing Solar Gain Bldg Shape Factor		-	0.300	0.300	
I17	Average Space Height (Floor to Ceiling)		ft	9.0	9.0	
I18	Infiltration		ach	0.250	0.250	
I19	Peak Number of Occupants		Qty	20	20	
I20	Sensible Heat Gain Per Person		Btu/h	250	250	
I21	Latent Heat Gain Per Person		Btu/h	200	200	
I22	Peak Lighting Load Power Density		W/ft ²	1.200	1.200	
I23	Peak Plug Load Power Density		W/ft ²	0.300	0.300	
I24	Peak Miscellaneous Load (Electrical)		Watt	0	0	
I25	Miscellaneous Load Located in Conditioned Space		Yes/No	No	No	
I26	HVAC On Cooling Space Temperature Set Point		°F	74.0	74.0	
I27	HVAC Off Cooling Space Temperature Set Point		°F	74.0	74.0	
I28	HVAC On Heating Space Temperature Set Point		°F	71.0	71.0	
I29	HVAC Off Heating Space Temperature Set Point		°F	66.0	66.0	

AHU & Plant Inputs:

Tag	Variable Description			Baseline	Proposed	Basis
I33	AHU Fan Power based on Control Type		Туре	CV	CV	
I34	Maximum AHU CFM		CFM	17,300	17,300	
I35	Minimum AHU CFM (% of Maximum CFM)		%	100.0%	100.0%	
I36	Maximum % Outside Air (Economizer % OSA)		%	100.0%	100.0%	
I37	Minimum % Outside Air (Occupied)		%	34.2%	34.2%	
I38	Minimum % Outside Air (Unoccupied)		%	3.0%	3.0%	
I39	Economizer High Limit Set Point		°F	65.0	65.0	
I40	Demand Controlled Ventilation (For Outside Air Contro	ol)	Yes/No	Yes	Yes	
I41	DCV Airflow Per Person (Based on Space Type)	DCV Tab	CFM/Per	10.00	10.00	
I42	DCV Airflow Per Area (Based on Space Type) DCV Tab		CFM/ft ²	0.09	0.09	
I43	AHU Fan TSP (At Max CFM)		in w.c.	1.500	1.500	
I44	Fan Efficiency		%	60.0%	60.0%	
I45	Supply Air Temperature @ OAT>	81.0	°F	65	65	
I46	Supply Air Temperature @ OAT>	41.0	°F	75	75	
I47	AHU Cooling Efficiency (EER)		BTU/Watt	10.1	10.1	
I48	Evaporative Cooling Effectiveness		%	0.0%	0.0%	
I49	AHU Cooling Lockout Below		°F	50.0	50.0	
I50	AHU Heating Efficiency or COP @ OAT> 28.0		COP	0.88	0.88	
I51	AHU Heating Efficiency or COP @ OAT> 27.0		COP	0.88	0.88	
I52	AHU Heating Energy Source		Type	Natural Gas	Natural Gas	
I53	AHU Heating Lockout Above		°F	75.0	75.0	
I54	Heat Recovery % Effectiveness		%	0.0%	0.0%	

Terminal Devices Inputs (Reheat Coils, VAV Boxes, Baseboard Heaters, etc)

Tag	Variable Description		Units	Baseline	Proposed	Basis
I58	Terminal Devices		Yes/No	Yes	Yes	
I59	Zone Heating Efficiency or COP @ OAT> 60.0		COP	0.88	0.88	
I60	Zone Heating Efficiency or COP @ OAT>	50.0	COP	0.88	0.88	
I61	Heating Energy Source Zone		Туре	Natural Gas	Natural Gas	
I62	Unoccupied Heating Done By		Zone, AHU	Zone Coil	Zone Coil	
I63	SFPMB Terminal Unit Power		W/CFM	0.00	0.00	

Domestic Hot Water Inputs:

Tag	Variable Description	Units	Baseline	Proposed	Basis
I67	DHW Fuel Type	Type	Natural Gas	Natural Gas	
I68	Energy Factor	-	0.55	0.97	
I69	Working Days Per Year (Used Only For DHW Calc)	Qty	365	365	
I70	Average Daily Hot Water Consumption Per Person	Gallons	6.9	6.9	
I71	Average Entering Cold Water Temperature	°F	50.0	50.0	
I72	Supply Hot Water Temperature	°F	120.0	120.0	

McK8760 - Outputs

13 Provide Domestic Hot Water Heater



Electric Demand

Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
07	Cooling Peak kW (Month = 7)	kW	28	-	28	-	0	-
08	AHU Heating Peak kW (Month = 1)	kW	0	-	0	-	0	-
09	Zone Heating Peak kW (Month = 1)	kW	0	-	0	-	0	-
010	Fan Peak kW	kW	5	-	5	-	0	-
011	Lights Peak kW	kW	24	-	24	-	0	-
012	Plug Load Peak kW	kW	6	-	6	-	0	-
013	Miscellaneous Load Peak kW	kW	0		0	-	0	-
014	Other Peak kW	kW	0	-	0	-	0	-
015	Peak kW (Month = 7)	kW	55	-	55	-	0	-
016	Peak kW (Sum 12 Monthly Peaks)	kW	530	-	530	-	0	-

Electricity

Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
020	Cooling	kWh/Yr	12,373	1.97	12,373	1.97	0	0.00
021	AHU Heating	kWh/Yr	0	0.00	0	0.00	0	0.00
022	Zone Heating	kWh/Yr	0	0.00	0	0.00	0	0.00
023	AHU Fans	kWh/Yr	31,558	5.03	31,558	5.03	0	0.00
024	Zone Fans	kWh/Yr	0	0.00	0	0.00	0	0.00
025	Lights	kWh/Yr	105,197	16.78	105,197	16.78	0	0.00
026	Plug Loads	kWh/Yr	34,681	5.53	34,681	5.53	0	0.00
027	Miscellaneous Loads	kWh/Yr	0	0.00	0	0.00	0	0.00
028	Domestic Hot Water	kWh/Yr	0	0.00	0	0.00	0	0.00
029	Other Electricity	kWh/Yr	0	0.00	0	0.00	0	0.00
030	Total	kWh/Yr	183,808	29.31	183,808	29.31	0	0.00

Natural Gas

Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
034	AHU Heating	Therm/Yr	4,839	22.61	4,839	22.61	0	0.00
035	Zone Heating	Therm/Yr	2,621	12.25	2,621	12.25	0	0.00
036	Domestic Hot Water	Therm/Yr	533	2.49	302	1.41	231	1.08
037	Other Natural Gas	Therm/Yr	0	0.00	0	0.00	0	0.00
038	Total	Therm/Yr	7,993	37.35	7,763	36.27	231	1.08

Steam

Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
042	AHU Heating	kLB/Yr	0	0.00	0	0.00	0	0.00
043	Zone Heating	kLB/Yr	0	0.00	0	0.00	0	0.00
044	Domestic Hot Water	kLB/Yr	0	0.00	0	0.00	0	0.00
045	Other Steam	kLB/Yr	0	0.00	0	0.00	0	0.00
046	Total Steam	kLB/Yr	0	0.00	0	0.00	0	0.00

Total Energy

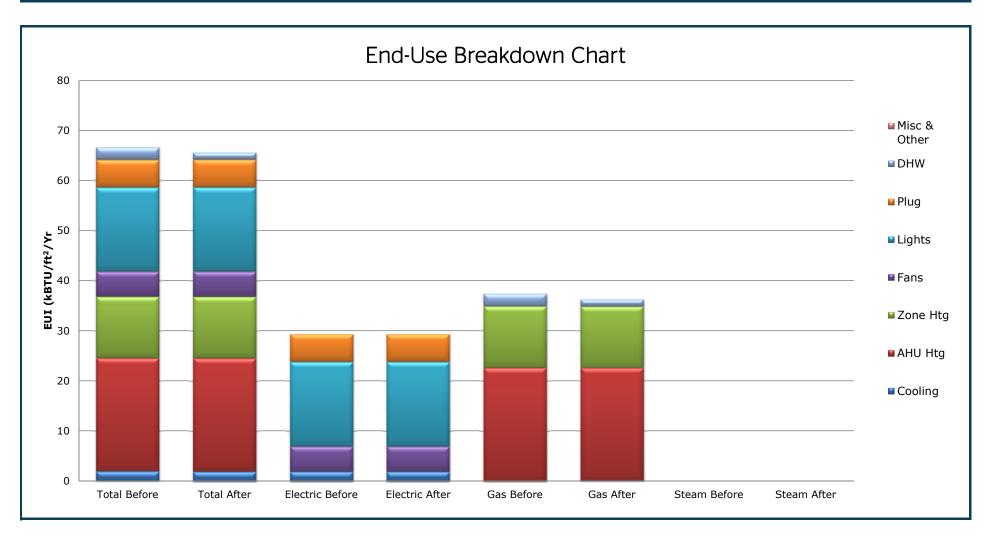
Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
O50 Total Energy		kBtu/Yr	1,426,686	66.67	1,403,605	65.59	23,081	1.08

McK8760 - End-Use Breakdown

13 Provide Domestic Hot Water Heater



EUI By Category	Cooling	AHU Htg	Zone Htg	Fans	Lights	Plug	DHW	Misc & Other	Total
Total Before	1.97	22.61	12.25	5.03	16.78	5.53	2.49	0.00	66.67
Total After	1.97	22.61	12.25	5.03	16.78	5.53	1.41	0.00	65.59
Electric Before	1.97	0.00	0.00	5.03	16.78	5.53	0.00	0.00	29.31
Electric After	1.97	0.00	0.00	5.03	16.78	5.53	0.00	0.00	29.31
Gas Before	0.00	22.61	12.25	0.00	0.00	0.00	2.49	0.00	37.35
Gas After	0.00	22.61	12.25	0.00	0.00	0.00	1.41	0.00	36.27
Steam Before	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Steam After	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



Facility Improvement Measure (FIM) Detail

Project	WA Governor's Residence
Scenario	FINAL
Date	December 2, 2013



	FIM ID	21581	Facility	WA Governors Mansion
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FIM Name 15 Recommissioning

FIM Description

This measure addresses the recommissioning of the existing HVAC systems and controls, the air handling units, baseboard convectors, exhaust fans, chilled water system, and control valves.

Existing Condition: The Residence is served by multiple constant volume chilled water air handling units, hydronic baseboard convectors, and other equipment. This equipment was observed to have multiple operations issues, including operating 24 hours a day regardless of building occupancy as well as a lack of nighttime temperature setback.

Proposed Condition: Provide retrocommissioning of the facility HVAC systems, including air handlers and baseboard convectors. Provide updated controls sequences for the Residence and Powerhouse chilled water plant such that after hours calls for cooling utilize the airside economizer as the first stage of cooling, the thermal mass of the chilled water loop as the second stage, and the water cooled chillers as the third stage.

Benefits: Energy savings will be realized through the rebalancing of the air handling unit air economizers, adjusting equipment run hours to match building occupancy, and implementing nighttime temperature setback.

Savings Methodology

Annual savings is calculated using a bin calculation calibrated to match the consumption recorded by the steam, electric, and chilled water submeters serving the residence. Baseline temperature setpoints and operating schedules are based on a logger data analysis of fancoil units FCU-102, FCU-105, and FCU-201 using data collected from 5/24/2013 thru 6/10/2013, and setpoints recorded from the building management system. Proposed temperature setpoints and operating schedules are based on the occupancy schedules and setback temperatures programmed into the building management system. The calculations take into account the heating system efficiency improvements included within the scope of FIM 01 Provide Decentralized Boiler, the glazing improvements included in the scope of FIM 05 Upgrade Single Pane Glazing, and the ventilation improvements included in the scope of FIM 08 Provide Demand Controlled Ventilation.

Utility Savings			
Utility Type	Utility Unit	Quantity Savings	Dollar Savings
Electricity	kWh	12,206	\$701
Electric Demand	kW	0	\$0
Natural Gas	Therm	528	\$301
Water	kgal	0	\$0
Sewer	kgal	0	\$0
Total			\$1,002

Confidential & Proprietary

McK8760 - HVAC Schedules

15 Recommissioning



Baseline HVAC Equipment Daily Schedules

Baseline - A - Weekly Schedule								
Н	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То							
0	1	1	1	1	1	1	1	1
1	2	1	1	1	1	1	1	1
2	3	1	1	1	1	1	1	1
3	4	1	1	1	1	1	1	1
4	5	1	1	1	1	1	1	1
5	6	1	1	1	1	1	1	1
6	7	1	1	1	1	1	1	1
7	8	1	1	1	1	1	1	1
8	9	1	1	1	1	1	1	1
9	10	1	1	1	1	1	1	1
10	11	1	1	1	1	1	1	1
11	12	1	1	1	1	1	1	1
12	13	1	1	1	1	1	1	1
13	14	1	1	1	1	1	1	1
14	15	1	1	1	1	1	1	1
15	16	1	1	1	1	1	1	1
16	17	1	1	1	1	1	1	1
17	18	1	1	1	1	1	1	1
18	19	1	1	1	1	1	1	1
19	20	1	1	1	1	1	1	1
20	21	1	1	1	1	1	1	1
21	22	1	1	1	1	1	1	1
22	23	1	1	1	1	1	1	1
23	24	1	1	1	1	1	1	1
Daily	Totals	24	24	24	24	24	24	24

	Baseline - B - Not Applicable							
Н	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То	1	2	3	4	5	6	7
0	1	0	0	0	0	0	0	0
1	2	0	0	0	0	0	0	0
2	3	0	0	0	0	0	0	0
3	4	0	0	0	0	0	0	0
4	5	0	0	0	0	0	0	0
5	6	0	0	0	0	0	0	0
6	7	0	0	0	0	0	0	0
7	8	0	1	1	1	1	1	0
8	9	0	1	1	1	1	1	0
9	10	0	1	1	1	1	1	0
10	11	0	1	1	1	1	1	0
11	12	0	1	1	1	1	1	0
12	13	0	1	1	1	1	1	0
13	14	0	1	1	1	1	1	0
14	15	0	1	1	1	1	1	0
15	16	0	1	1	1	1	1	0
16	17	0	0	0	0	0	0	0
17	18	0	0	0	0	0	0	0
18	19	0	0	0	0	0	0	0
19	20	0	0	0	0	0	0	0
20	21	0	0	0	0	0	0	0
21	22	0	0	0	0	0	0	0
22	23	0	0	0	0	0	0	0
23	24	0	0	0	0	0	0	0
Daily	Totals	0	9	9	9	9	9	0

0 = Schedule OFF 1 = Scheduled ON							d ON	
		Ва	seline -	C - Not	Applical	ole		
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То							
0	1	0	0	0	0	0	0	0
1	2	0	0	0	0	0	0	0
2	3	0	0	0	0	0	0	0
3	4	0	0	0	0	0	0	0
4	5	0	0	0	0	0	0	0
5	6	0	0	0	0	0	0	0
6	7	0	0	0	0	0	0	0
7	8	0	0	0	0	0	0	0
8	9	0	0	0	0	0	0	0
9	10	0	1	1	1	1	1	0
10	11	0	1	1	1	1	1	0
11	12	0	1	1	1	1	1	0
12	13	0	1	1	1	1	1	0
13	14	0	1	1	1	1	1	0
14	15	0	1	1	1	1	1	0
15	16	0	0	0	0	0	0	0
16	17	0	0	0	0	0	0	0
17	18	0	0	0	0	0	0	0
18	19	0	0	0	0	0	0	0
19	20	0	0	0	0	0	0	0
20	21	0	0	0	0	0	0	0
21	22	0	0	0	0	0	0	0
22	23	0	0	0	0	0	0	0
23	24	0	0	0	0	0	0	0
Daily	Totals	0	6	6	6	6	6	0

Proposed HVAC Equipment Daily Schedules

Proposed - A - Weekly Schedule								
Но	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То	1	2	3	4	5	6	7
0	1	0	0	0	0	0	0	0
1	2	0	0	0	0	0	0	0
2	3	0	0	0	0	0	0	0
3	4	0	0	0	0	0	0	0
4	5	0	0	0	0	0	0	0
5	6	1	1	1	1	1	1	1
6	7	1	1	1	1	1	1	1
7	8	1	1	1	1	1	1	1
8	9	1	1	1	1	1	1	1
9	10	1	1	1	1	1	1	1
10	11	1	1	1	1	1	1	1
11	12	1	1	1	1	1	1	1
12	13	1	1	1	1	1	1	1
13	14	1	1	1	1	1	1	1
14	15	1	1	1	1	1	1	1
15	16	1	1	1	1	1	1	1
16	17	1	1	1	1	1	1	1
17	18	1	1	1	1	1	1	1
18	19	1	1	1	1	1	1	1
19	20	1	1	1	1	1	1	1
20	21	1	1	1	1	1	1	1
21	22	1	1	1	1	1	1	1
22	23	0	0	0	0	0	0	0
23	24	0	0	0	0	0	0	0
Daily	Totals	17	17	17	17	17	17	17

	Proposed - B - Not Applicable							
Н	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То	1	2	3	4	5	6	7
0	1	0	0	0	0	0	0	0
1	2	0	0	0	0	0	0	0
2	3	0	0	0	0	0	0	0
3	4	0	0	0	0	0	0	0
4	5	0	0	0	0	0	0	0
5	6	0	0	0	0	0	0	0
6	7	0	0	0	0	0	0	0
7	8	0	1	1	1	1	1	0
8	9	0	1	1	1	1	1	0
9	10	0	1	1	1	1	1	0
10	11	0	1	1	1	1	1	0
11	12	0	1	1	1	1	1	0
12	13	0	1	1	1	1	1	0
13	14	0	1	1	1	1	1	0
14	15	0	1	1	1	1	1	0
15	16	0	1	1	1	1	1	0
16	17	0	0	0	0	0	0	0
17	18	0	0	0	0	0	0	0
18	19	0	0	0	0	0	0	0
19	20	0	0	0	0	0	0	0
20	21	0	0	0	0	0	0	0
21	22	0	0	0	0	0	0	0
22	23	0	0	0	0	0	0	0
23	24	0	0	0	0	0	0	0
Daily	Totals	0	9	9	9	9	9	0

0 = Schedule OFF	1 = Scheduled ON
Proposed - C - Not An	nlicable

	Proposed - C - Not Applicable										
Но	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat			
From	То	1	2	3	4	5	6				
0	1	0	0	0	0	0	0	0			
1	2	0	0	0	0	0	0	0			
2	3	0	0	0	0	0	0	0			
3	4	0	0	0	0	0	0	0			
4	5	0	0	0	0	0	0	0			
5	6	0	0	0	0	0	0	0			
6	7	0	0	0	0	0	0	0			
7	8	0	0	0	0	0	0	0			
8	9	0	0	0	0	0	0	0			
9	10	0	1	1	1	1	1	0			
10	11	0	1	1	1	1	1	0			
11	12	0	1	1	1	1	1	0			
12	13	0	1	1	1	1	1	0			
13	14	0	1	1	1	1	1	0			
14	15	0	1	1	1	1	1	0			
15	16	0	0	0	0	0	0	0			
16	17	0	0	0	0	0	0	0			
17	18	0	0	0	0	0	0	0			
18	19	0	0	0	0	0	0	0			
19	20	0	0	0	0	0	0	0			
20	21	0	0	0	0	0	0	0			
21	22	0	0	0	0	0	0	0			
22	23	0	0	0	0	0	0	0			
23	24	0	0	0	0	0	0	0			
Daily	Totals	0	6	6	6	6	6	0			

McK8760 - Occupancy Schedules

15 Recommissioning



Baseline Occupancy Load Profiles (Percent of Peak Occupancy)

	Baseline - A - Weekly Schedule								
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat	
From	То		2						
0	1	20%	20%	20%	20%	20%	20%	20%	
1	2	20%	20%	20%	20%	20%	20%	20%	
2	3	20%	20%	20%	20%	20%	20%	20%	
3	4	20%	20%	20%	20%	20%	20%	20%	
4	5	20%	20%	20%	20%	20%	20%	20%	
5	6	20%	20%	20%	20%	20%	20%	20%	
6	7	20%	20%	20%	20%	20%	20%	20%	
7	8	20%	20%	20%	20%	20%	20%	20%	
8	9	20%	20%	20%	20%	20%	20%	20%	
9	10	90%	90%	90%	90%	90%	90%	90%	
10	11	90%	90%	90%	90%	90%	90%	90%	
11	12	80%	80%	80%	80%	80%	80%	80%	
12	13	80%	80%	80%	80%	80%	80%	80%	
13	14	80%	80%	80%	80%	80%	80%	80%	
14	15	80%	80%	80%	80%	80%	80%	80%	
15	16	45%	45%	45%	45%	45%	45%	45%	
16	17	20%	20%	20%	20%	20%	20%	20%	
17	18	20%	20%	20%	20%	20%	20%	20%	
18	19	20%	20%	20%	20%	20%	20%	20%	
19	20	20%	20%	20%	20%	20%	20%	20%	
20	21	20%	20%	20%	20%	20%	20%	20%	
21	22	20%	20%	20%	20%	20%	20%	20%	
22	23	20%	20%	20%	20%	20%	20%	20%	
23	24	20%	20%	20%	20%	20%	20%	20%	

	Baseline - B - Not Applicable										
Ho	ur	Sun	Mon	Tue	Wed	Thu	Fri	Sat			
From	То	1	2	3	4	5	6	7			
0	1	0%	0%	0%	0%	0%	0%	0%			
1	2	0%	0%	0%	0%	0%	0%	0%			
2	3	0%	0%	0%	0%	0%	0%	0%			
3	4	0%	0%	0%	0%	0%	0%	0%			
4	5	0%	0%	0%	0%	0%	0%	0%			
5	6	0%	0%	0%	0%	0%	0%	0%			
6	7	0%	0%	0%	0%	0%	0%	0%			
7	8	0%	2%	2%	2%	2%	2%	0%			
8	9	0%	35%	35%	35%	35%	35%	0%			
9	10	0%	45%	45%	45%	45%	45%	0%			
10	11	0%	45%	45%	45%	45%	45%	0%			
11	12	0%	40%	40%	40%	40%	40%	0%			
12	13	0%	40%	40%	40%	40%	40%	0%			
13	14	0%	40%	40%	40%	40%	40%	0%			
14	15	0%	40%	40%	40%	40%	40%	0%			
15	16	0%	25%	25%	25%	25%	25%	0%			
16	17	0%	2%	2%	2%	2%	2%	0%			
17	18	0%	0%	0%	0%	0%	0%	0%			
18	19	0%	0%	0%	0%	0%	0%	0%			
19	20	0%	0%	0%	0%	0%	0%	0%			
20	21	0%	0%	0%	0%	0%	0%	0%			
21	22	0%	0%	0%	0%	0%	0%	0%			
22	23	0%	0%	0%	0%	0%	0%	0%			
23	24	0%	0%	0%	0%	0%	0%	0%			

	Baseline - C - Not Applicable									
Но	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То	1	2	3	4	5	6	7		
0	1	0%	0%	0%	0%	0%	0%	0%		
1	2	0%	0%	0%	0%	0%	0%	0%		
2	3	0%	0%	0%	0%	0%	0%	0%		
3	4	0%	0%	0%	0%	0%	0%	0%		
4	5	0%	0%	0%	0%	0%	0%	0%		
5	6	0%	0%	0%	0%	0%	0%	0%		
6	7	0%	0%	0%	0%	0%	0%	0%		
7	8	0%	2%	2%	2%	2%	2%	0%		
8	9	0%	5%	5%	5%	5%	5%	0%		
9	10	0%	5%	5%	5%	5%	5%	0%		
10	11	0%	5%	5%	5%	5%	5%	0%		
11	12	0%	5%	5%	5%	5%	5%	0%		
12	13	0%	5%	5%	5%	5%	5%	0%		
13	14	0%	5%	5%	5%	5%	5%	0%		
14	15	0%	5%	5%	5%	5%	5%	0%		
15	16	0%	2%	2%	2%	2%	2%	0%		
16	17	0%	2%	2%	2%	2%	2%	0%		
17	18	0%	0%	0%	0%	0%	0%	0%		
18	19	0%	0%	0%	0%	0%	0%	0%		
19	20	0%	0%	0%	0%	0%	0%	0%		
20	21	0%	0%	0%	0%	0%	0%	0%		
21	22	0%	0%	0%	0%	0%	0%	0%		
22	23	0%	0%	0%	0%	0%	0%	0%		
23	24	0%	0%	0%	0%	0%	0%	0%		

Proposed Occupancy Load Profiles (Percent of Peak Occupancy)

			, _								
	Proposed - A - Weekly Schedule										
Н	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat			
From	То	1	2	3	4	5	6	7			
0	1	20%	20%	20%	20%	20%	20%	20%			
1	2	20%	20%	20%	20%	20%	20%	20%			
2	3	20%	20%	20%	20%	20%	20%	20%			
3	4	20%	20%	20%	20%	20%	20%	20%			
4	5	20%	20%	20%	20%	20%	20%	20%			
5	6	20%	20%	20%	20%	20%	20%	20%			
6	7	20%	20%	20%	20%	20%	20%	20%			
7	8	20%	20%	20%	20%	20%	20%	20%			
8	9	20%	20%	20%	20%	20%	20%	20%			
9	10	90%	90%	90%	90%	90%	90%	90%			
10	11	90%	90%	90%	90%	90%	90%	90%			
11	12	80%	80%	80%	80%	80%	80%	80%			
12	13	80%	80%	80%	80%	80%	80%	80%			
13	14	80%	80%	80%	80%	80%	80%	80%			
14	15	80%	80%	80%	80%	80%	80%	80%			
15	16	45%	45%	45%	45%	45%	45%	45%			
16	17	20%	20%	20%	20%	20%	20%	20%			
17	18	20%	20%	20%	20%	20%	20%	20%			
18	19	20%	20%	20%	20%	20%	20%	20%			
19	20	20%	20%	20%	20%	20%	20%	20%			
20	21	20%	20%	20%	20%	20%	20%	20%			
21	22	20%	20%	20%	20%	20%	20%	20%			
22	23	20%	20%	20%	20%	20%	20%	20%			
23	24	20%	20%	20%	20%	20%	20%	20%			

	Proposed - B - Not Applicable										
Ho	ur	Sun	Mon	Tue	Wed	Thu	Fri	Sat			
From	То	1	2	3	4	5	6	7			
0	1	0%	0%	0%	0%	0%	0%	0%			
1	2	0%	0%	0%	0%	0%	0%	0%			
2	3	0%	0%	0%	0%	0%	0%	0%			
3	4	0%	0%	0%	0%	0%	0%	0%			
4	5	0%	0%	0%	0%	0%	0%	0%			
5	6	0%	0%	0%	0%	0%	0%	0%			
6	7	0%	0%	0%	0%	0%	0%	0%			
7	8	0%	2%	2%	2%	2%	2%	0%			
8	9	0%	35%	35%	35%	35%	35%	0%			
9	10	0%	45%	45%	45%	45%	45%	0%			
10	11	0%	45%	45%	45%	45%	45%	0%			
11	12	0%	40%	40%	40%	40%	40%	0%			
12	13	0%	40%	40%	40%	40%	40%	0%			
13	14	0%	40%	40%	40%	40%	40%	0%			
14	15	0%	40%	40%	40%	40%	40%	0%			
15	16	0%	25%	25%	25%	25%	25%	0%			
16	17	0%	2%	2%	2%	2%	2%	0%			
17	18	0%	0%	0%	0%	0%	0%	0%			
18	19	0%	0%	0%	0%	0%	0%	0%			
19	20	0%	0%	0%	0%	0%	0%	0%			
20	21	0%	0%	0%	0%	0%	0%	0%			
21	22	0%	0%	0%	0%	0%	0%	0%			
22	23	0%	0%	0%	0%	0%	0%	0%			
23	24	0%	0%	0%	0%	0%	0%	0%			

	Proposed - C - Not Applicable									
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То	1	2	3	4	5	6	7		
0	1	0%	0%	0%	0%	0%	0%	0%		
1	2	0%	0%	0%	0%	0%	0%	0%		
2	3	0%	0%	0%	0%	0%	0%	0%		
3	4	0%	0%	0%	0%	0%	0%	0%		
4	5	0%	0%	0%	0%	0%	0%	0%		
5	6	0%	0%	0%	0%	0%	0%	0%		
6	7	0%	0%	0%	0%	0%	0%	0%		
7	8	0%	2%	2%	2%	2%	2%	0%		
8	9	0%	5%	5%	5%	5%	5%	0%		
9	10	0%	5%	5%	5%	5%	5%	0%		
10	11	0%	5%	5%	5%	5%	5%	0%		
11	12	0%	5%	5%	5%	5%	5%	0%		
12	13	0%	5%	5%	5%	5%	5%	0%		
13	14	0%	5%	5%	5%	5%	5%	0%		
14	15	0%	5%	5%	5%	5%	5%	0%		
15	16	0%	2%	2%	2%	2%	2%	0%		
16	17	0%	2%	2%	2%	2%	2%	0%		
17	18	0%	0%	0%	0%	0%	0%	0%		
18	19	0%	0%	0%	0%	0%	0%	0%		
19	20	0%	0%	0%	0%	0%	0%	0%		
20	21	0%	0%	0%	0%	0%	0%	0%		
21	22	0%	0%	0%	0%	0%	0%	0%		
22	23	0%	0%	0%	0%	0%	0%	0%		
23	24	0%	0%	0%	0%	0%	0%	0%		

McK8760 - Lighting Schedules

15 Recommissioning



Baseline Lighting Load Profiles (Percent of Peak Lighting Load)

From To 1 2 3 4 5 6 0 1 20% 20% 20% 20% 20% 20% 20 20% 20 20% <th>ri Sat</th>	ri Sat
From To 1 2 3 4 5 6 0 1 20% 20% 20% 20% 20% 20% 20 20% 20 20% <th></th>	
0 1 20% 20% 20% 20% 20% 20 20%	c 7
1 2 20%	D /
2 3 20%	9% 20%
3 4 20% 20% 20% 20% 20% 20 20%	9% 20%
4 5 20% 20% 20% 20% 20% 20 20%	9% 20%
5 6 20% 20% 20% 20% 20% 20 20%	9% 20%
6 7 20% 20% 20% 20% 20% 20% 20 20% 30%	9% 20%
7 8 20% 30% 30% 30% 30% 30 8 9 85% 85% 85% 85% 85% 85 85% 85% 85% 85% 85% 85% 85% 85% 85% 85%	9% 20%
8 9 85% 85% 85% 85% 85% 85	9% 20%
	9% 20%
9 10 95% 95% 95% 95% 95% 95% 95	85%
	95%
10 11 95% 95% 95% 95% 95% 95	95%
11 12 95% 95% 95% 95% 95% 95	95%
12 13 80% 80% 80% 80% 80% 80	80%
13 14 80% 80% 80% 80% 80% 80	80%
14 15 80% 80% 80% 80% 80% 80	80%
15 16 70% 70% 70% 70% 70% 70	70%
16 17 50% 50% 50% 50% 50% 50% 50% 50%	9% 50%
17 18 50% 50% 50% 50% 50% 50	9% 50%
18 19 35% 35% 35% 35% 35% 35% 35%	35%
19 20 35% 35% 35% 35% 35% 35% 35	35%
20 21 35% 35% 35% 35% 35% 35% 35	35%
21 22 30% 30% 30% 30% 30% 30	30%
22 23 20% 20% 20% 20% 20% 20% 20	9% 20%
23 24 20% 20% 20% 20% 20% 20	

	Baseline - B - Not Applicable									
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То	1	2	3	4	5	6	7		
0	1	5%	5%	5%	5%	5%	5%	5%		
1	2	5%	5%	5%	5%	5%	5%	5%		
2	3	5%	5%	5%	5%	5%	5%	5%		
3	4	5%	5%	5%	5%	5%	5%	5%		
4	5	5%	5%	5%	5%	5%	5%	5%		
5	6	5%	5%	5%	5%	5%	5%	5%		
6	7	5%	5%	5%	5%	5%	5%	5%		
7	8	5%	15%	15%	15%	15%	15%	5%		
8	9	5%	45%	45%	45%	45%	45%	5%		
9	10	5%	50%	50%	50%	50%	50%	5%		
10	11	5%	50%	50%	50%	50%	50%	5%		
11	12	5%	50%	50%	50%	50%	50%	5%		
12	13	5%	45%	45%	45%	45%	45%	5%		
13	14	5%	45%	45%	45%	45%	45%	5%		
14	15	5%	45%	45%	45%	45%	45%	5%		
15	16	5%	25%	25%	25%	25%	25%	5%		
16	17	5%	15%	15%	15%	15%	15%	5%		
17	18	5%	15%	15%	15%	15%	15%	5%		
18	19	5%	15%	15%	15%	15%	15%	5%		
19	20	5%	15%	15%	15%	15%	15%	5%		
20	21	5%	15%	15%	15%	15%	15%	5%		
21	22	5%	15%	15%	15%	15%	15%	5%		
22	23	5%	5%	5%	5%	5%	5%	5%		
23	24	5%	5%	5%	5%	5%	5%	5%		

		Ва	seline -	C - Not	Applical	ole		
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То	1	2	3	4	5	6	7
0	1	5%	5%	5%	5%	5%	5%	5%
1	2	5%	5%	5%	5%	5%	5%	5%
2	3	5%	5%	5%	5%	5%	5%	5%
3	4	5%	5%	5%	5%	5%	5%	5%
4	5	5%	5%	5%	5%	5%	5%	5%
5	6	5%	5%	5%	5%	5%	5%	5%
6	7	5%	5%	5%	5%	5%	5%	5%
7	8	5%	10%	10%	10%	10%	10%	5%
8	9	5%	15%	15%	15%	15%	15%	5%
9	10	5%	25%	25%	25%	25%	25%	5%
10	11	5%	25%	25%	25%	25%	25%	5%
11	12	5%	25%	25%	25%	25%	25%	5%
12	13	5%	25%	25%	25%	25%	25%	5%
13	14	5%	25%	25%	25%	25%	25%	5%
14	15	5%	25%	25%	25%	25%	25%	5%
15	16	5%	15%	15%	15%	15%	15%	5%
16	17	5%	10%	10%	10%	10%	10%	5%
17	18	5%	5%	5%	5%	5%	5%	5%
18	19	5%	5%	5%	5%	5%	5%	5%
19	20	5%	5%	5%	5%	5%	5%	5%
20	21	5%	5%	5%	5%	5%	5%	5%
21	22	5%	5%	5%	5%	5%	5%	5%
22	23	5%	5%	5%	5%	5%	5%	5%
23	24	5%	5%	5%	5%	5%	5%	5%

Proposed Lighting Load Profiles (Percent of Peak Lighting Load)

		9	9					
		Prop	osed - /	A - Wee	kly Sche	dule		
Н	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То	1	2	3	4	5	6	7
0	1	20%	20%	20%	20%	20%	20%	20%
1	2	20%	20%	20%	20%	20%	20%	20%
2	3	20%	20%	20%	20%	20%	20%	20%
3	4	20%	20%	20%	20%	20%	20%	20%
4	5	20%	20%	20%	20%	20%	20%	20%
5	6	20%	20%	20%	20%	20%	20%	20%
6	7	20%	20%	20%	20%	20%	20%	20%
7	8	20%	30%	30%	30%	30%	30%	20%
8	9	85%	85%	85%	85%	85%	85%	85%
9	10	95%	95%	95%	95%	95%	95%	95%
10	11	95%	95%	95%	95%	95%	95%	95%
11	12	95%	95%	95%	95%	95%	95%	95%
12	13	80%	80%	80%	80%	80%	80%	80%
13	14	80%	80%	80%	80%	80%	80%	80%
14	15	80%	80%	80%	80%	80%	80%	80%
15	16	70%	70%	70%	70%	70%	70%	70%
16	17	50%	50%	50%	50%	50%	50%	50%
17	18	50%	50%	50%	50%	50%	50%	50%
18	19	35%	35%	35%	35%	35%	35%	35%
19	20	35%	35%	35%	35%	35%	35%	35%
20	21	35%	35%	35%	35%	35%	35%	35%
21	22	30%	30%	30%	30%	30%	30%	30%
22	23	20%	20%	20%	20%	20%	20%	20%
23	24	20%	20%	20%	20%	20%	20%	20%

Proposed - B - Not Applicable										
Hour Sun Mon Tue Wed Thu Fri								Sat		
From	То	1	2	3	4	5	6	7		
0	1	5%	5%	5%	5%	5%	5%	5%		
1	2	5%	5%	5%	5%	5%	5%	5%		
2	3	5%	5%	5%	5%	5%	5%	5%		
3	4	5%	5%	5%	5%	5%	5%	5%		
4	5	5%	5%	5%	5%	5%	5%	5%		
5	6	5%	5%	5%	5%	5%	5%	5%		
6	7	5%	5%	5%	5%	5%	5%	5%		
7	8	5%	15%	15%	15%	15%	15%	5%		
8	9	5%	45%	45%	45%	45%	45%	5%		
9	10	5%	50%	50%	50%	50%	50%	5%		
10	11	5%	50%	50%	50%	50%	50%	5%		
11	12	5%	50%	50%	50%	50%	50%	5%		
12	13	5%	45%	45%	45%	45%	45%	5%		
13	14	5%	45%	45%	45%	45%	45%	5%		
14	15	5%	45%	45%	45%	45%	45%	5%		
15	16	5%	25%	25%	25%	25%	25%	5%		
16	17	5%	15%	15%	15%	15%	15%	5%		
17	18	5%	15%	15%	15%	15%	15%	5%		
18	19	5%	15%	15%	15%	15%	15%	5%		
19	20	5%	15%	15%	15%	15%	15%	5%		
20	21	5%	15%	15%	15%	15%	15%	5%		
21	22	5%	15%	15%	15%	15%	15%	5%		
22	23	5%	5%	5%	5%	5%	5%	5%		
23	24	5%	5%	5%	5%	5%	5%	5%		

	Proposed - C - Not Applicable									
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То	1	2	3	4	5	6	7		
0	1	5%	5%	5%	5%	5%	5%	5%		
1	2	5%	5%	5%	5%	5%	5%	5%		
2	3	5%	5%	5%	5%	5%	5%	5%		
3	4	5%	5%	5%	5%	5%	5%	5%		
4	5	5%	5%	5%	5%	5%	5%	5%		
5	6	5%	5%	5%	5%	5%	5%	5%		
6	7	5%	5%	5%	5%	5%	5%	5%		
7	8	5%	10%	10%	10%	10%	10%	5%		
8	9	5%	15%	15%	15%	15%	15%	5%		
9	10	5%	25%	25%	25%	25%	25%	5%		
10	11	5%	25%	25%	25%	25%	25%	5%		
11	12	5%	25%	25%	25%	25%	25%	5%		
12	13	5%	25%	25%	25%	25%	25%	5%		
13	14	5%	25%	25%	25%	25%	25%	5%		
14	15	5%	25%	25%	25%	25%	25%	5%		
15	16	5%	15%	15%	15%	15%	15%	5%		
16	17	5%	10%	10%	10%	10%	10%	5%		
17	18	5%	5%	5%	5%	5%	5%	5%		
18	19	5%	5%	5%	5%	5%	5%	5%		
19	20	5%	5%	5%	5%	5%	5%	5%		
20	21	5%	5%	5%	5%	5%	5%	5%		
21	22	5%	5%	5%	5%	5%	5%	5%		
22	23	5%	5%	5%	5%	5%	5%	5%		
23	24	5%	5%	5%	5%	5%	5%	5%		

McK8760 - Plug Load Schedules

15 Recommissioning



Baseline Plug Load Profiles (Percent of Peak Plug Load)

Baseline - A - Weekly Schedule										
Ho	ur	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То	1	2	3	4	5	6			
0	1	50%	50%	50%	50%	50%	50%	50%		
1	2	50%	50%	50%	50%	50%	50%	50%		
2	3	50%	50%	50%	50%	50%	50%	50%		
3	4	50%	50%	50%	50%	50%	50%	50%		
4	5	50%	50%	50%	50%	50%	50%	50%		
5	6	50%	50%	50%	50%	50%	50%	50%		
6	7	50%	50%	50%	50%	50%	50%	50%		
7	8	50%	50%	50%	50%	50%	50%	50%		
8	9	85%	85%	85%	85%	85%	85%	85%		
9	10	95%	95%	95%	95%	95%	95%	95%		
10	11	95%	95%	95%	95%	95%	95%	95%		
11	12	95%	95%	95%	95%	95%	95%	95%		
12	13	80%	80%	80%	80%	80%	80%	80%		
13	14	80%	80%	80%	80%	80%	80%	80%		
14	15	80%	80%	80%	80%	80%	80%	80%		
15	16	70%	70%	70%	70%	70%	70%	70%		
16	17	50%	50%	50%	50%	50%	50%	50%		
17	18	50%	50%	50%	50%	50%	50%	50%		
18	19	50%	50%	50%	50%	50%	50%	50%		
19	20	50%	50%	50%	50%	50%	50%	50%		
20	21	50%	50%	50%	50%	50%	50%	50%		
21	22	50%	50%	50%	50%	50%	50%	50%		
22	23	50%	50%	50%	50%	50%	50%	50%		
23	24	50%	50%	50%	50%	50%	50%	50%		

Baseline - B - Not Applicable										
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat		
From	То							7		
0	1	5%	5%	5%	5%	5%	5%	5%		
1	2	5%	5%	5%	5%	5%	5%	5%		
2	3	5%	5%	5%	5%	5%	5%	5%		
3	4	5%	5%	5%	5%	5%	5%	5%		
4	5	5%	5%	5%	5%	5%	5%	5%		
5	6	5%	5%	5%	5%	5%	5%	5%		
6	7	5%	5%	5%	5%	5%	5%	5%		
7	8	5%	15%	15%	15%	15%	15%	5%		
8	9	5%	45%	45%	45%	45%	45%	5%		
9	10	5%	50%	50%	50%	50%	50%	5%		
10	11	5%	50%	50%	50%	50%	50%	5%		
11	12	5%	50%	50%	50%	50%	50%	5%		
12	13	5%	45%	45%	45%	45%	45%	5%		
13	14	5%	45%	45%	45%	45%	45%	5%		
14	15	5%	45%	45%	45%	45%	45%	5%		
15	16	5%	25%	25%	25%	25%	25%	5%		
16	17	5%	10%	10%	10%	10%	10%	5%		
17	18	5%	5%	5%	5%	5%	5%	5%		
18	19	5%	5%	5%	5%	5%	5%	5%		
19	20	5%	5%	5%	5%	5%	5%	5%		
20	21	5%	5%	5%	5%	5%	5%	5%		
21	22	5%	5%	5%	5%	5%	5%	5%		
22	23	5%	5%	5%	5%	5%	5%	5%		
23	24	5%	5%	5%	5%	5%	5%	5%		

	Baseline - C - Not Applicable										
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat			
From	То	1	2	3	4	5	6	7			
0	1	5%	5%	5%	5%	5%	5%	5%			
1	2	5%	5%	5%	5%	5%	5%	5%			
2	3	5%	5%	5%	5%	5%	5%	5%			
3	4	5%	5%	5%	5%	5%	5%	5%			
4	5	5%	5%	5%	5%	5%	5%	5%			
5	6	5%	5%	5%	5%	5%	5%	5%			
6	7	5%	5%	5%	5%	5%	5%	5%			
7	8	5%	10%	10%	10%	10%	10%	5%			
8	9	5%	15%	15%	15%	15%	15%	5%			
9	10	5%	15%	15%	15%	15%	15%	5%			
10	11	5%	15%	15%	15%	15%	15%	5%			
11	12	5%	15%	15%	15%	15%	15%	5%			
12	13	5%	15%	15%	15%	15%	15%	5%			
13	14	5%	15%	15%	15%	15%	15%	5%			
14	15	5%	15%	15%	15%	15%	15%	5%			
15	16	5%	15%	15%	15%	15%	15%	5%			
16	17	5%	10%	10%	10%	10%	10%	5%			
17	18	5%	5%	5%	5%	5%	5%	5%			
18	19	5%	5%	5%	5%	5%	5%	5%			
19	20	5%	5%	5%	5%	5%	5%	5%			
20	21	5%	5%	5%	5%	5%	5%	5%			
21	22	5%	5%	5%	5%	5%	5%	5%			
22	23	5%	5%	5%	5%	5%	5%	5%			
23	24	5%	5%	5%	5%	5%	5%	5%			

Proposed Plug Load Profiles (Percent of Peak Plug Load)

. торосои.		9		J			••••	
		Prop	osed - i	A - Wee	kly Sche	dule		
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat
From	То	1	2	3	4	5	6	7
0	1	50%	50%	50%	50%	50%	50%	50%
1	2	50%	50%	50%	50%	50%	50%	50%
2	3	50%	50%	50%	50%	50%	50%	50%
3	4	50%	50%	50%	50%	50%	50%	50%
4	5	50%	50%	50%	50%	50%	50%	50%
5	6	50%	50%	50%	50%	50%	50%	50%
6	7	50%	50%	50%	50%	50%	50%	50%
7	8	50%	50%	50%	50%	50%	50%	50%
8	9	85%	85%	85%	85%	85%	85%	85%
9	10	95%	95%	95%	95%	95%	95%	95%
10	11	95%	95%	95%	95%	95%	95%	95%
11	12	95%	95%	95%	95%	95%	95%	95%
12	13	80%	80%	80%	80%	80%	80%	80%
13	14	80%	80%	80%	80%	80%	80%	80%
14	15	80%	80%	80%	80%	80%	80%	80%
15	16	70%	70%	70%	70%	70%	70%	70%
16	17	50%	50%	50%	50%	50%	50%	50%
17	18	50%	50%	50%	50%	50%	50%	50%
18	19	50%	50%	50%	50%	50%	50%	50%
19	20	50%	50%	50%	50%	50%	50%	50%
20	21	50%	50%	50%	50%	50%	50%	50%
21	22	50%	50%	50%	50%	50%	50%	50%
22	23	50%	50%	50%	50%	50%	50%	50%
23	24	50%	50%	50%	50%	50%	50%	50%

	Proposed - B - Not Applicable										
Ho	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat			
From	То	1	2	3	4	5	6	7			
0	1	5%	5%	5%	5%	5%	5%	5%			
1	2	5%	5%	5%	5%	5%	5%	5%			
2	3	5%	5%	5%	5%	5%	5%	5%			
3	4	5%	5%	5%	5%	5%	5%	5%			
4	5	5%	5%	5%	5%	5%	5%	5%			
5	6	5%	5%	5%	5%	5%	5%	5%			
6	7	5%	5%	5%	5%	5%	5%	5%			
7	8	5%	15%	15%	15%	15%	15%	5%			
8	9	5%	45%	45%	45%	45%	45%	5%			
9	10	5%	50%	50%	50%	50%	50%	5%			
10	11	5%	50%	50%	50%	50%	50%	5%			
11	12	5%	50%	50%	50%	50%	50%	5%			
12	13	5%	45%	45%	45%	45%	45%	5%			
13	14	5%	45%	45%	45%	45%	45%	5%			
14	15	5%	45%	45%	45%	45%	45%	5%			
15	16	5%	25%	25%	25%	25%	25%	5%			
16	17	5%	10%	10%	10%	10%	10%	5%			
17	18	5%	5%	5%	5%	5%	5%	5%			
18	19	5%	5%	5%	5%	5%	5%	5%			
19	20	5%	5%	5%	5%	5%	5%	5%			
20	21	5%	5%	5%	5%	5%	5%	5%			
21	22	5%	5%	5%	5%	5%	5%	5%			
22	23	5%	5%	5%	5%	5%	5%	5%			
23	24	5%	5%	5%	5%	5%	5%	5%			

	Proposed - C - Not Applicable										
Но	our	Sun	Mon	Tue	Wed	Thu	Fri	Sat			
From	To	1	2	3	4	5	6	7			
0	1	5%	5%	5%	5%	5%	5%	5%			
1	2	5%	5%	5%	5%	5%	5%	5%			
2	3	5%	5%	5%	5%	5%	5%	5%			
3	4	5%	5%	5%	5%	5%	5%	5%			
4	5	5%	5%	5%	5%	5%	5%	5%			
5	6	5%	5%	5%	5%	5%	5%	5%			
6	7	5%	5%	5%	5%	5%	5%	5%			
7	8	5%	10%	10%	10%	10%	10%	5%			
8	9	5%	15%	15%	15%	15%	15%	5%			
9	10	5%	15%	15%	15%	15%	15%	5%			
10	11	5%	15%	15%	15%	15%	15%	5%			
11	12	5%	15%	15%	15%	15%	15%	5%			
12	13	5%	15%	15%	15%	15%	15%	5%			
13	14	5%	15%	15%	15%	15%	15%	5%			
14	15	5%	15%	15%	15%	15%	15%	5%			
15	16	5%	15%	15%	15%	15%	15%	5%			
16	17	5%	10%	10%	10%	10%	10%	5%			
17	18	5%	5%	5%	5%	5%	5%	5%			
18	19	5%	5%	5%	5%	5%	5%	5%			
19	20	5%	5%	5%	5%	5%	5%	5%			
20	21	5%	5%	5%	5%	5%	5%	5%			
21	22	5%	5%	5%	5%	5%	5%	5%			
22	23	5%	5%	5%	5%	5%	5%	5%			
23	24	5%	5%	5%	5%	5%	5%	5%			

McK8760 - Calendar

15 Recommissioning



Calendar

Weekends Highlighted Yellow For Reference Year 1989

Month	1	2	3	4	5	6	7	8	9	10	11	12
Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
2	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
3	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
4	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
5	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
6	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
7	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
8	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
9	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
10	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
11	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
12	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
13	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
14	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
15	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
16	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
17	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
18	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
19	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
20	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
21	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
22	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
23	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
24	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
25	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
26	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
27	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
28	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
29	Α		Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
30	Α		Α	Α	Α	Α	Α	Α	Α	Α	Α	Α
31	Α		Α		Α		Α	Α		Α		Α

Holidays and Observances: (Reference Year 1989)

Jan 1	New Year's Day	May 29	Memorial Day	Oct 31	Halloween
Jan 16	MLK Day	Jul 4	Independence Day	Nov 11	Veterans Day
Feb 20	Presidents' Day	Sep 4	Labor Day	Nov 23	Thanksgiving Day
Mar 26	Easter Sunday	Oct 9	Columbus Day	Dec 25	Christmas Day

Schedules Summary

Scenario	Scenario Title	Total Days/Yr	Total Hrs/Yr	Baseline HVAC On Hrs/Yr	Proposed HVAC On Hrs/Yr
Schedule A	Weekly Schedule	365	8,760	8,760	6,205
Schedule B	Not Applicable	0	0	0	0
Schedule C	Not Applicable	0	0	0	0
_		365	8,760	8,760	6,205

McK8760 - Inputs

15 Recommissioning



Zone Inputs:

Tag	Variable Description		Units	Baseline	Proposed	Basis
I7	Floor Area		ft ²	21,400	21,400	
18	Roof Area		ft ²	7,183	7,183	
I9	Opaque Wall Area		ft ²	7,027	7,027	
I10	Glazing Area	Glazing	ft ²	1,757	1,757	
I12	Roof U-Factor	Roof	BTU/ft ² /°F	0.200	0.200	
I13	Opaque Wall U-Factor	Walls	BTU/ft ² /°F	0.140	0.140	
I14	Glazing U-Factor	Glazing	BTU/ft ² /°F	0.590	0.590	
I15	Glazing Shading Heat Gain Coefficient	Glazing	-	0.900	0.900	
I16	Glazing Solar Gain Bldg Shape Factor		-	0.300	0.300	
I17	Average Space Height (Floor to Ceiling)		ft	9.0	9.0	
I18	Infiltration		ach	0.250	0.250	
I19	Peak Number of Occupants		Qty	20	20	
I20	Sensible Heat Gain Per Person		Btu/h	250	250	
I21	Latent Heat Gain Per Person		Btu/h	200	200	
I22	Peak Lighting Load Power Density		W/ft ²	1.200	1.200	
I23	Peak Plug Load Power Density		W/ft ²	0.300	0.300	
I24	Peak Miscellaneous Load (Electrical)		Watt	0	0	
I25	Miscellaneous Load Located in Conditioned Space		Yes/No	No	No	
I26	HVAC On Cooling Space Temperature Set Point		°F	74.0	74.0	
I27	HVAC Off Cooling Space Temperature Set Point		°F	74.0	74.0	
I28	HVAC On Heating Space Temperature Set Point		°F	71.0	71.0	
I29	HVAC Off Heating Space Temperature Set Point		°F	66.0	66.0	

AHU & Plant Inputs:

Tag	Variable Description		Units	Baseline	Proposed	Basis
I33	AHU Fan Power based on Control Type		Туре	CV	CV	
I34	Maximum AHU CFM	CFM	17,300	17,300		
I35	Minimum AHU CFM (% of Maximum CFM)		%	100.0%	100.0%	
I36	Maximum % Outside Air (Economizer % OSA)		%	100.0%	100.0%	
I37	Minimum % Outside Air (Occupied)		%	34.2%	34.2%	
I38	Minimum % Outside Air (Unoccupied)		%	3.0%	3.0%	
I39	Economizer High Limit Set Point		°F	65.0	65.0	
I40	Demand Controlled Ventilation (For Outside Air Contro	ol)	Yes/No	Yes	Yes	
I41	DCV Airflow Per Person (Based on Space Type)	DCV Tab	CFM/Per	10.00	10.00	
I42	DCV Airflow Per Area (Based on Space Type)	DCV Tab	CFM/ft ²	0.09	0.09	
I43	AHU Fan TSP (At Max CFM)		in w.c.	1.500	1.500	
I44	Fan Efficiency		%	60.0%	60.0%	
I45	Supply Air Temperature @ OAT>	81.0	°F	65	65	
I46	Supply Air Temperature @ OAT>	41.0	°F	75	75	
I47	AHU Cooling Efficiency (EER)		BTU/Watt	10.1	10.1	
I48	Evaporative Cooling Effectiveness		%	0.0%	0.0%	
I49	AHU Cooling Lockout Below		°F	50.0	50.0	
I50	AHU Heating Efficiency or COP @ OAT>	28.0	COP	0.88	0.88	
I51	AHU Heating Efficiency or COP @ OAT>	COP	0.88	0.88		
I52	AHU Heating Energy Source			Natural Gas	Natural Gas	
I53	AHU Heating Lockout Above			75.0	75.0	
I54	Heat Recovery % Effectiveness		%	0.0%	0.0%	

Terminal Devices Inputs (Reheat Coils, VAV Boxes, Baseboard Heaters, etc)

Tag	Variable Description		Units	Baseline	Proposed	Basis
I58	Terminal Devices		Yes/No	Yes	Yes	
I59	Zone Heating Efficiency or COP @ OAT>	60.0	COP	0.88	0.88	
I60	Zone Heating Efficiency or COP @ OAT> 50.0			0.88	0.88	
I61	Heating Energy Source Zone		Туре	Natural Gas	Natural Gas	
I62	Unoccupied Heating Done By			Zone Coil	Zone Coil	
I63	SFPMB Terminal Unit Power		W/CFM	0.00	0.00	

Domestic Hot Water Inputs:

Tag	Variable Description	Units	Baseline	Proposed	Basis
I67	DHW Fuel Type	Type	Natural Gas	Natural Gas	
I68	Energy Factor	-	0.82	0.82	
I69	Working Days Per Year (Used Only For DHW Calc)	Qty	180	180	
I70	Average Daily Hot Water Consumption Per Person	Gallons	1.0	1.0	
I71	Average Entering Cold Water Temperature	°F	50.0	50.0	
I72	Supply Hot Water Temperature	°F	120.0	120.0	

McK8760 - Outputs

15 Recommissioning



Electric Demand

Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
07	Cooling Peak kW (Month = 7)	kW	28	-	28	-	0	-
08	AHU Heating Peak kW (Month = 1)	kW	0	-	0	-	0	-
09	Zone Heating Peak kW (Month = 1)	kW	0	-	0	-	0	-
010	Fan Peak kW	kW	5	-	5	-	0	-
011	Lights Peak kW	kW	24	-	24	-	0	-
012	Plug Load Peak kW	kW	6	-	6	-	0	-
013	Miscellaneous Load Peak kW	kW	0		0	-	0	-
014	Other Peak kW	kW	0	-	0	-	0	-
015	Peak kW (Month = 7)	kW	55	-	55	-	0	-
016	Peak kW (Sum 12 Monthly Peaks)	kW	530	-	530	-	0	-

Electricity

Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
020	Cooling	kWh/Yr	12,941	2.06	12,373	1.97	567	0.09
021	AHU Heating	kWh/Yr	0	0.00	0	0.00	0	0.00
022	Zone Heating	kWh/Yr	0	0.00	0	0.00	0	0.00
023	AHU Fans	kWh/Yr	44,552	7.11	31,558	5.03	12,994	2.07
024	Zone Fans	kWh/Yr	0	0.00	0	0.00	0	0.00
025	Lights	kWh/Yr	105,197	16.78	105,197	16.78	0	0.00
026	Plug Loads	kWh/Yr	34,681	5.53	34,681	5.53	0	0.00
027	Miscellaneous Loads	kWh/Yr	0	0.00	0	0.00	0	0.00
028	Domestic Hot Water	kWh/Yr	0	0.00	0	0.00	0	0.00
029	Other Electricity	kWh/Yr	0	0.00	0	0.00	0	0.00
030	Total	kWh/Yr	197,370	31.48	183,808	29.31	13,562	2.16

Natural Gas

Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
034	AHU Heating	Therm/Yr	6,042	28.23	4,839	22.61	1,203	5.62
035	Zone Heating	Therm/Yr	2,005	9.37	2,621	12.25	-616	-2.88
036	Domestic Hot Water	Therm/Yr	26	0.12	26	0.12	0	0.00
037	Other Natural Gas	Therm/Yr	0	0.00	0	0.00	0	0.00
038	Total	Therm/Yr	8,073	37.72	7,486	34.98	587	2.74

Steam

Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
042	AHU Heating	kLB/Yr	0	0.00	0	0.00	0	0.00
043	Zone Heating	kLB/Yr	0	0.00	0	0.00	0	0.00
044	Domestic Hot Water	kLB/Yr	0	0.00	0	0.00	0	0.00
045	Other Steam	kLB/Yr	0	0.00	0	0.00	0	0.00
046	Total Steam	kLB/Yr	0	0.00	0	0.00	0	0.00

Total Energy

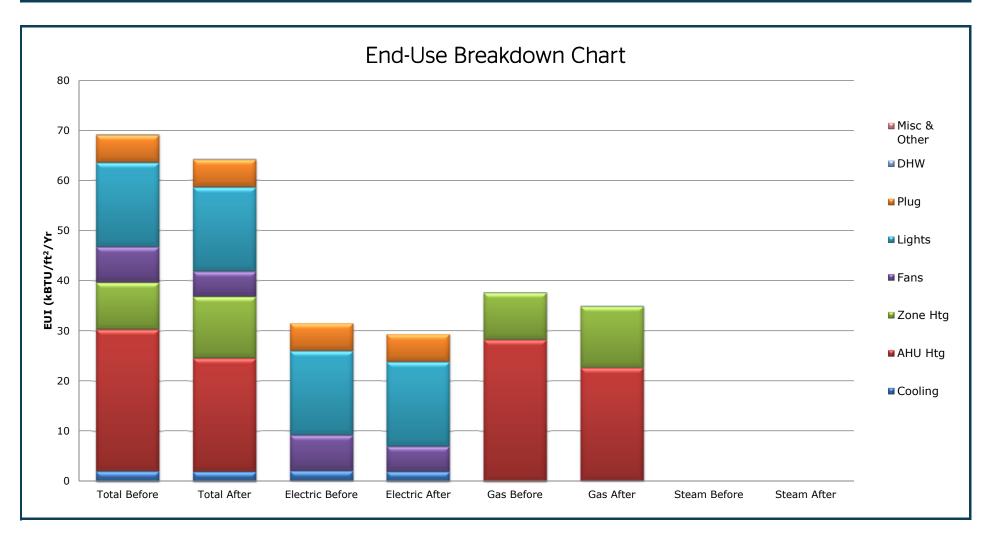
Tag	Description	Units	Baseline	EUI	Proposed	EUI	Savings	EUI
050	Total Energy	kBtu/Yr	1,480,882	69.20	1,375,931	64.30	104,951	4.90

McK8760 - End-Use Breakdown





EUI By Category	Cooling	AHU Htg	Zone Htg	Fans	Lights	Plug	DHW	Misc & Other	Total
Total Before	2.06	28.23	9.37	7.11	16.78	5.53	0.12	0.00	69.20
Total After	1.97	22.61	12.25	5.03	16.78	5.53	0.12	0.00	64.30
Electric Before	2.06	0.00	0.00	7.11	16.78	5.53	0.00	0.00	31.48
Electric After	1.97	0.00	0.00	5.03	16.78	5.53	0.00	0.00	29.31
Gas Before	0.00	28.23	9.37	0.00	0.00	0.00	0.12	0.00	37.72
Gas After	0.00	22.61	12.25	0.00	0.00	0.00	0.12	0.00	34.98
Steam Before	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Steam After	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



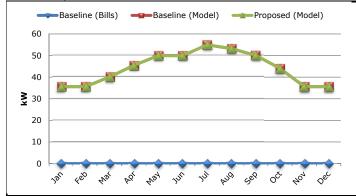
McK8760 - Model Tuning Charts

15 Recommissioning



#DIV/0!

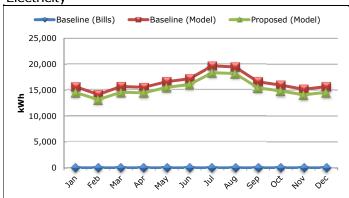
Electricity Demand



Month	Baseline (Bills)	Baseline (Model)	Proposed (Model)
Jan	0	36	36
Feb	0	36	36
Mar	0	40	40
Apr	0	46	46
May	0	50	50
Jun	0	50	50
Jul	0	55	55
Aug	0	53	53
Sep	0	50	50
Oct	0	44	44
Nov	0	36	36
Dec	0	36	36
Total	0	530	530
% Delta Between Base	eline (Bills) & Baseline	(Model)	100%

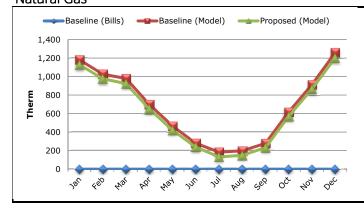
RSQ (Correlation Coefficient)

Electricity



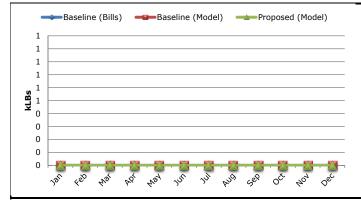
Month	Baseline (Bills)	Baseline (Model)	Proposed (Model)
Jan	0	15,660	14,556
Feb	0	14,147	13,150
Mar	0	15,695	14,591
Apr	0	15,534	14,465
May	0	16,628	15,510
Jun	0	17,181	16,081
Jul	0	19,684	18,351
Aug	0	19,455	18,192
Sep	0	16,611	15,426
Oct	0	15,953	14,834
Nov	0	15,159	14,091
Dec	0	15,665	14,561
Total	0	197,370	183,808
% Delta Between Ba	100%		
RSQ (Correlation Co	pefficient)		#DIV/0!

Natural Gas



Month	Baseline (Bills)	Baseline (Model)	Proposed (Model)
Jan	0	1,180	1,127
Feb	0	1,025	976
Mar	0	979	924
Apr	0	699	650
May	0	465	420
Jun	0	280	239
Jul	0	183	131
Aug	0	198	150
Sep	0	278	232
Oct	0	617	571
Nov	0	911	864
Dec	0	1,258	1,201
Total	0	8,073	7,486
•	•		
	aseline (Bills) & Baseline	(Model)	100%
Q (Correlation Co	efficient)		#DIV/0!

Steam



Month	Baseline (Bills)	Baseline (Model)	Proposed (Model)
Jan	0	0	0
Feb	0	0	0
Mar	0	0	0
Apr	0	0	0
May	0	0	0
Jun	0	0	0
Jul	0	0	0
Aug	0	0	0
Sep	0	0	0
Oct	0	0	0
Nov	0	0	0
Dec	0	0	0
Total	0	0	0

% Delta Between Baseline (Bills) & Baseline (Model)	#DIV/0!
RSQ (Correlation Coefficient)	#DIV/0!

Directed Engineering Study cont.

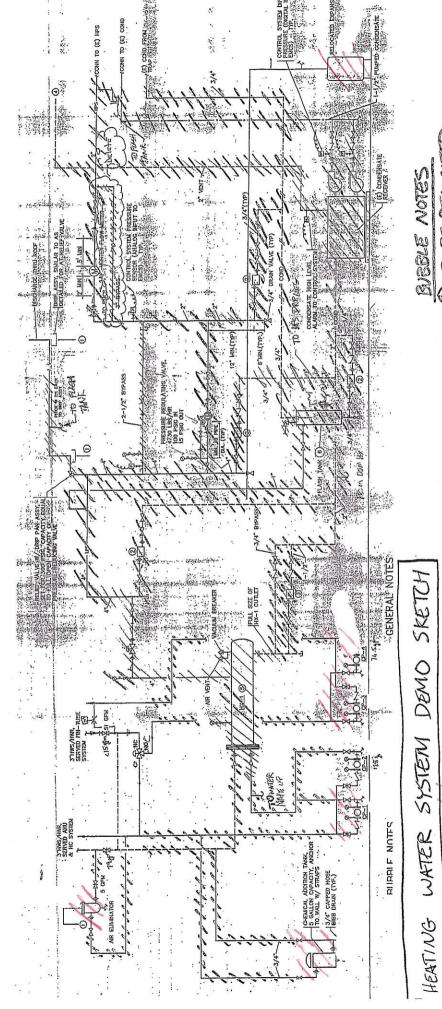
5.4 FIMS - ADDITIONAL SCOPE DOCUMENTS

MECHANICAL SCOPE SKETCHES

MECHANICAL CUT SHEETS

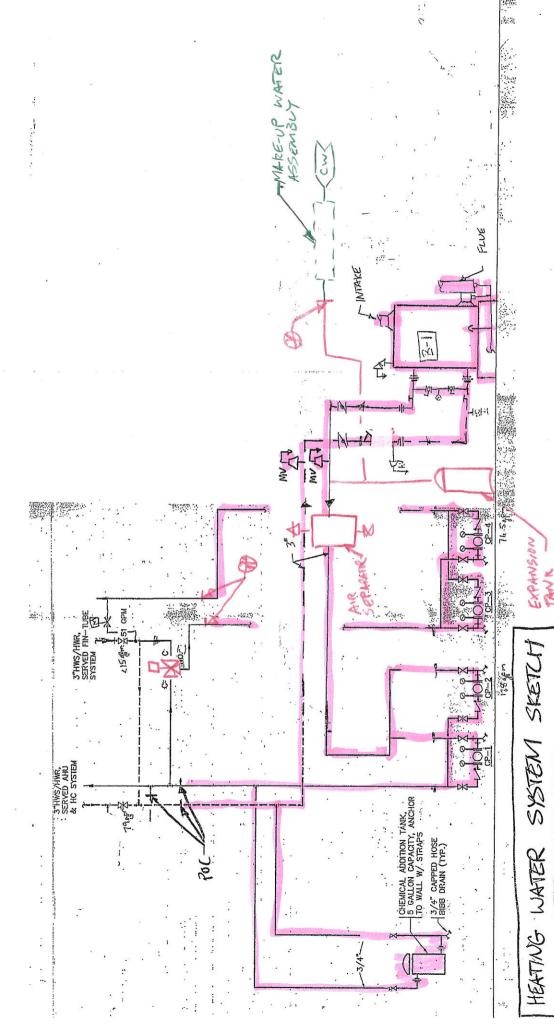
PLUMBING SCOPE SKETCHES





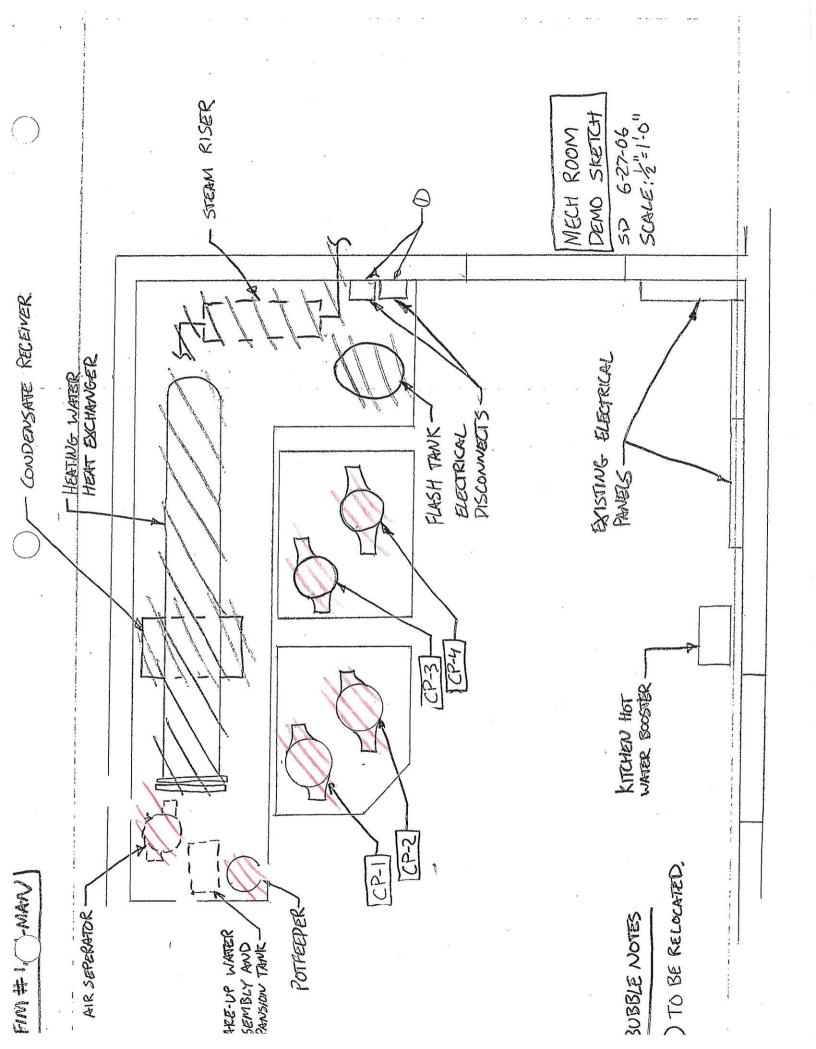
BJEBLE NOTES 10 TO BE RELOCATED

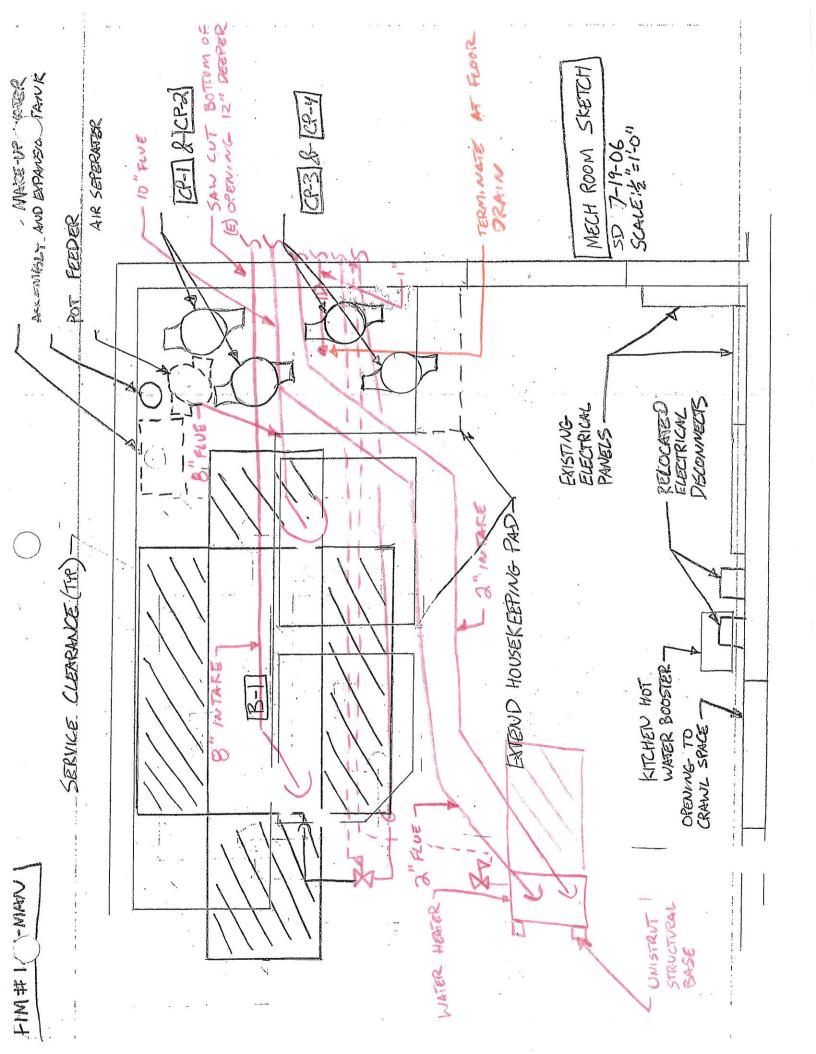
SO 6-27-06 REVIEWS

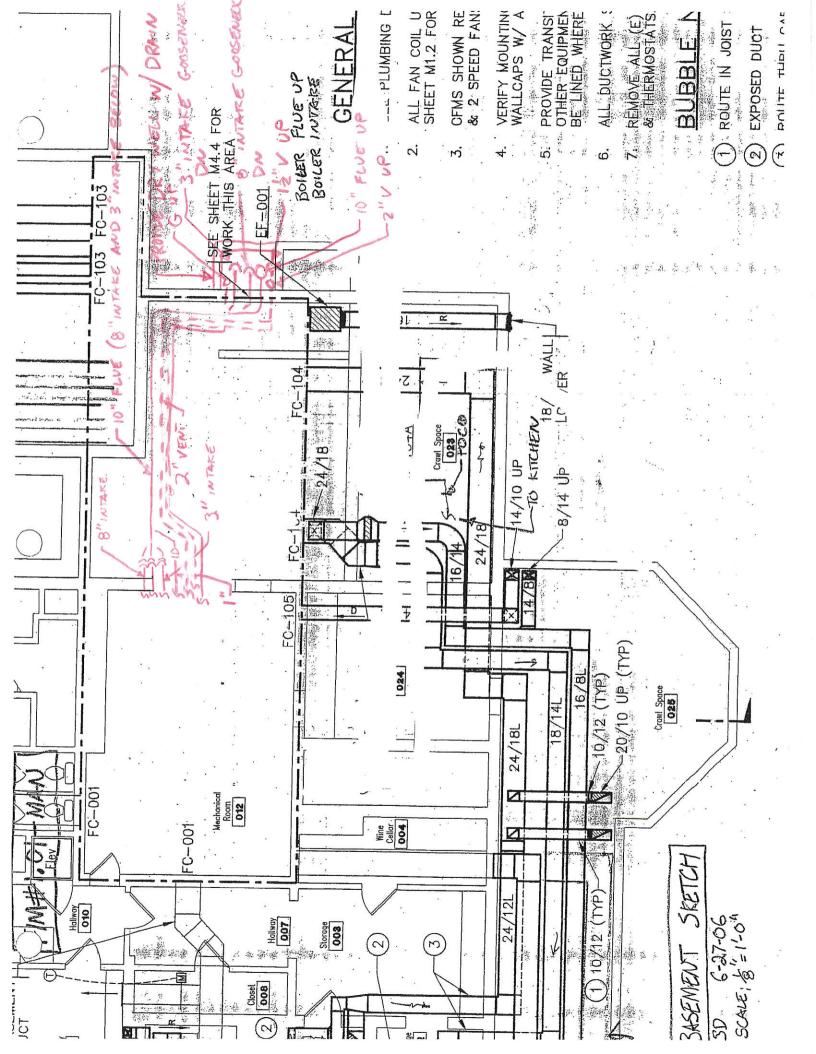


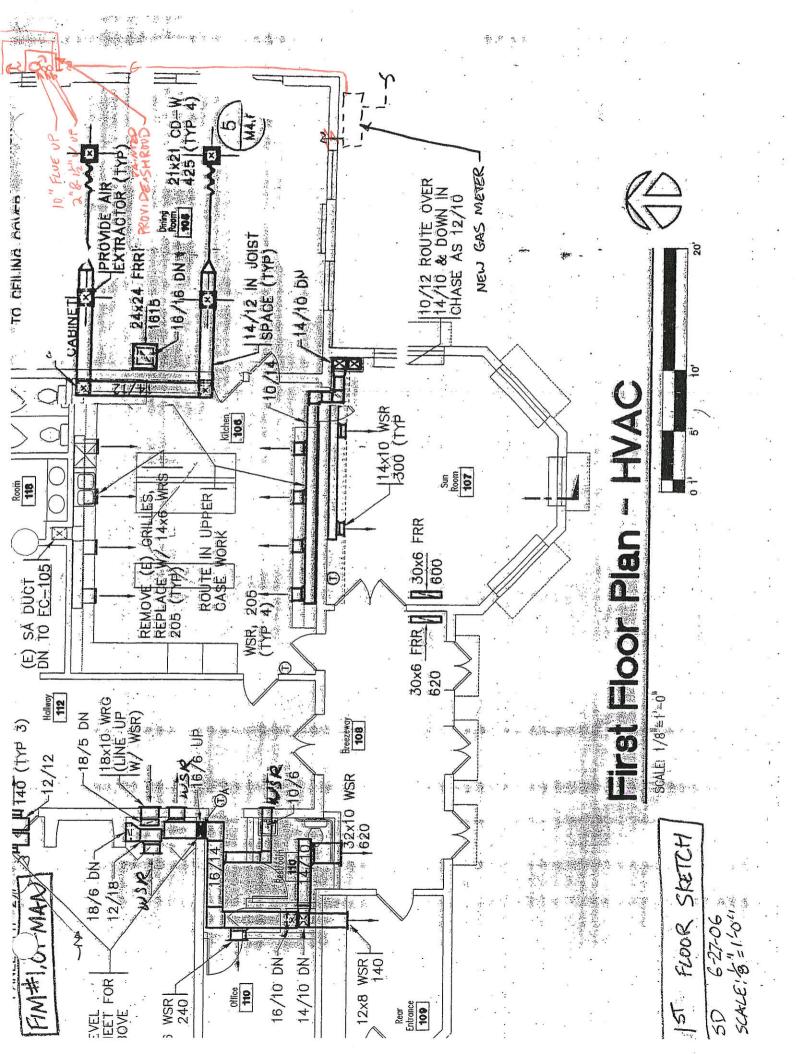
INEW WORK

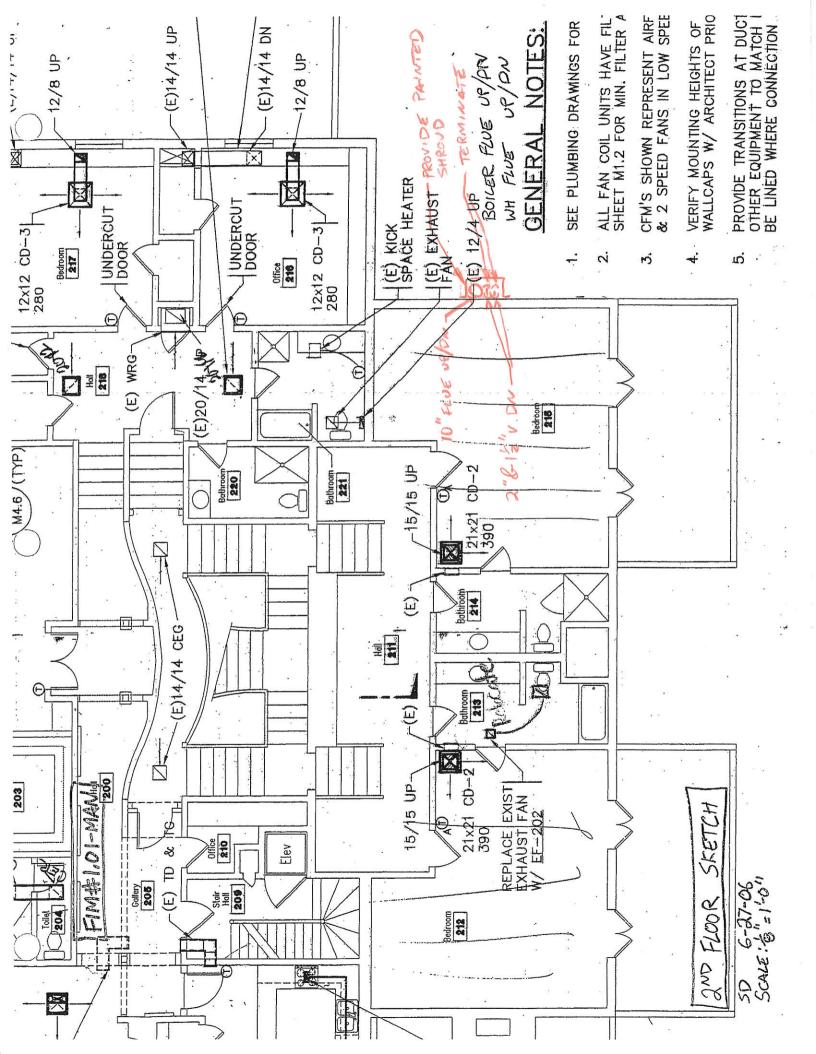
50 7-19-06 SCALE; NONE

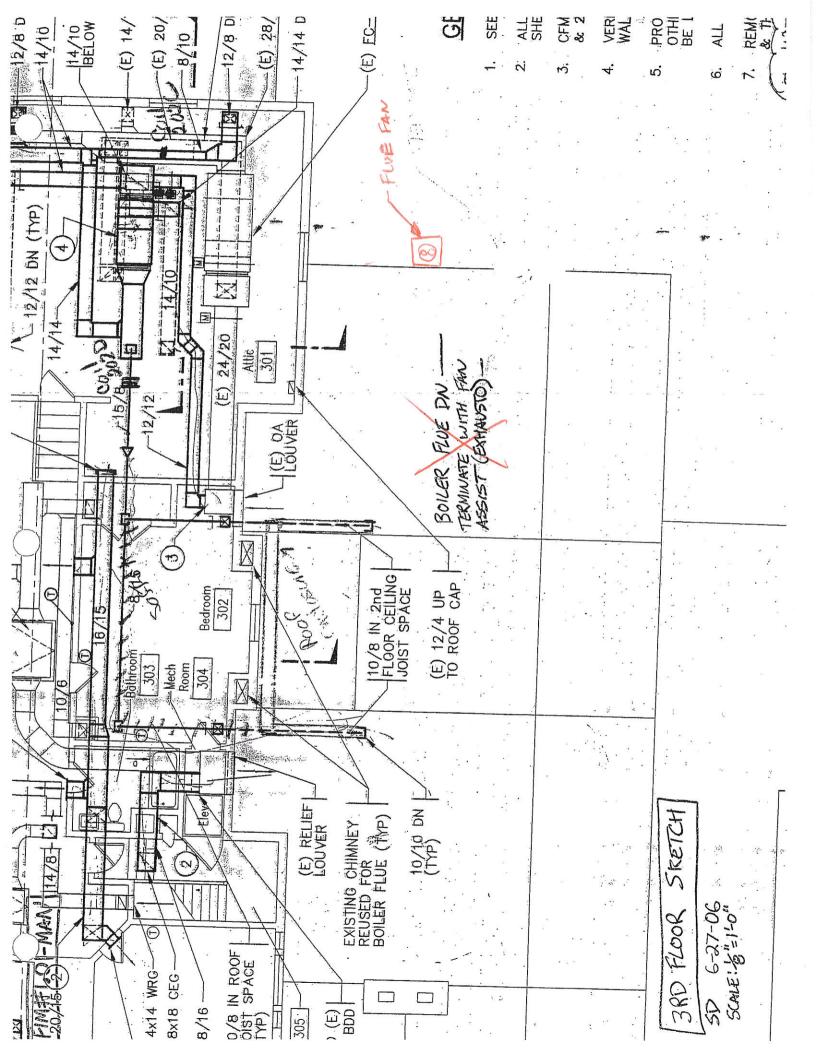














A	.	В			С			1		D				Е			-		F				G				H	ı			J			Κ
				-									FAI	v C	OIL	U	VIT	- SC	HED)UL	E							-						,
	SPECIFIED			SUP	PLY FA	AN						Н	EATING	COIL									COOLIN	G COIL					FILT	FRS	T	T	T	
SYMBOL	MANUFACTURER AND SERIES NO.	AREA SERVED	CFM	TSP	RPM	WHEEL DIA.		VOLT/PH	CAP MBH	ROWS FPI	COIL SIZE		AIR SI		CDM	WATER		PD. FT	CAP MBH	ROWS			AIR SID			WATER			TYPE	MIN. SE	COIL	MIN. OA	MAX. UNIT WEIGHT	REMARKS
F0 004	2405 471 475						-			2					_		_		MOH	FPI		EDB/EWB	LDB LD COOL		GPM	EWT	ΔT±	PD, FT		-	OA		(LBS)	
FC-001	PACE 13A-135	BASEMENT	4000	1.5"	951	13.5"	3	208/3	190	8	33x38	41	85	0.15	13	200	30	3	-				0000	10				-	2" THICK 30%	8.8	2000	500	500	
FC-101*	PACE 12A-114	BALLROOM	2000	1.5"	1400	10.6"	2	208/3	140	2 8	25.5×26	20	85	0.15	10	200	30	3	75	8	25.5×26	86/66	55	0.70	10	42	13	3	2" THICK 30%	4.4	2000	2000	400	W/ 2 SPEED MOTOR, 180% O
FC-102	PACE 12A-114	DINING ROOM	1700	1.5"	1340	10.6"	1.5	208/3	81	2 8	25.5×26	41	85	.0.15	65.5	200	30	3	51	6 10	25.5×26	81/64	55	0.35	8	42	13	3	2" THICK 30%	4.4	850	250	400	W/ 2 SPEED MOTOR, 0-1009 OA ECONOMIZER
FC-103	PACE 12A-114	LIBRARY, SITTING, ENTRY	2040	1.5"	1440	10.6"	2	208/3	53	2 8	25.5×26	41	65	0.15	4	200	30	3	61	8	25.5×26	81/64	55	0.70	9	42	13	3	2" THICK 30%	4.4	1020	1000	400	W/ 2 SPEED MOTOR
FC-104	PACE 12A-114	PARLOR, HALL, SUN ROOM	2700	1.5"	1380	10.6*	2	208/3	70	8	25.5x26	41	65	0.15	5	200	30	3	81	8 8	25.5x26	81/64	55	0.65	13	42	13	3	2" THICK 30%	4.4	1350	300	400	W/ 2 SPEED MOTOR
FC-105	PACE 12A-114	KITCHEN	1640	1.6"	1480	10.6*	2	208/3	78	2 8	25.5×26	41	85	0.15	5.5	200	30	3	49	8	25.5x26	81/64	55	0.80	8	42	13	3	2" THICK 30%	4.6	820	300	450	W/ 2 SPEED MOTOR
FC-201	PACE 9A-73	2nd FLOOR FAMILY RM, MASTER BEDROOM	1400	1.5"	1920	7.3*	1	208/3	36	2 8	16.5x22	41	65	0.15	2.5	200	30	3	42	8	16.5×22	81/64	55	0.50	6	42	13	3	2" THICK 30%	1.5	750	200	250	W/ 2 SPEED MOTOR
FC-202	PACE 12A-114	2nd FLOOR EAST & SOUTH BEDROOMS	1820	1.5"	1200	10.6*	1	208/3	47	2 8	25.5x26	41	65	0.15	3.5	200	30	3	55	6 12	25.5x26	81/64	55	0.40	8	42	13	3	2" THICK 30%	4.4	910	250	400	W/ 2 SPEED MOTOR
FC-301**	PACE 12A-114	3rd FLOOR	1620	1.5"	1300	10.6"	1.5	208/3	89	2 8	25.5×26	45	85	0.15	6	200	30	3	-			N	O COOL	NG				_	2" THICK 30%	4.4	825	250	400	
																						6	•	-		<u></u>								
NOTES:		PS NOTED ARE MAXIMUMS AVE 100% OA, ECONOMIZE			T BE E	XCEEDE).	*	FC-101	IS EXIS	S ARE 180 TING TO RE G CONTROL	MAIN.	PROVID	E COOL	ING CO	IL IN U	NIT. V	/ERIFY A	CTUAL UN	NT SIZE	E; REQ'MTS	4. Pro	ovide N Stallation Scheen	ofup asin	ove.	l For	-101	** FC-	-301 IS F	UTURE, I	FOR OWNER'S	S INFORMATI	ON ONLY.	
																						a	~	1										-
			FA	N S	СН	EDU	ILE																	DUC	T (COIL	SC	HE	DULE	=				
SAMBOI	SPECIFIED MANUFACTU	RER AREA		34 5	en.	DDM	WHEEL	ELECTR	ICAL .	PINE OO		_	EMADES										COIL			Г –			TING PERF		-			

SYMBOL	SPECIFIED MANUFACTURER AND SERIES NUMBER	TYPE	AREA SERVED	CFM	ESP	RPM	WHEEL	ELEC HP	TRICAL V/PH	DRIVE	CONTROL	REMARKS
EF-001	GREENHECK	INLINE CABINET	MECH ROOM	-	.25"	-	-	3/4	115/1	-	-	
EF-201	GREENHECK	INLINE CABINET	MASTER SUITE	250	.375"	-	-	1/4	115/1	BELT	-	-
EF-202	GREENHECK	INLINE CABINET	TOILET	100	.375"	-	- 1	1/8	115/1	BELT	-	
EF-301*	PACE SCF-114	CABINET FAN	HOUSE RELIEF	3000	0.625"	960	12.6"	1.5	208/3	BELT	-	INTERNALLY SPRING ISOLATED, 2 SPEED MOTOR
EF-302*	PACE SCF-52	CABINET FAN	ATTIC EXHAUST	300	0.5"	1880	5.2*	1/4	115/1	BELT	-	INTERNALLY SPRING ISOLATED

	SPECIFIED MFR		T	GPM	HEAD	ELE	CTRICAL		
SYMBOL	AND SERIES NO	TYPE	SERVICE	GPM	FT. H20	HP	VOLTS/PH	REMARKS	
CP-1	BELL & GOSSETT SERIES 80	HORIZONTAL INLINE	PRIMARY HWS FAN COILS, HC'S	128	65'	5	208/3	BRONZE FITTED	
CP-2	BELL & GOSSETT SERIES 80	VERTICAL INLINE	PRIMARY HWS FAN COILS, HC'S	128	65'	5	208/3	BRONZE FITTED	
CP-3	BELL & GOSSETT SERIES 80	VERTICAL INLINE	FIN-TUBE HEAT	76.5	45'	2	208/3	BRONZE FITTED	
CP-4	BELL & GOSSETT SERIES 80	VERTICAL INLINE	FIN-TUBE HEAT	76.5	30'	2	208/3	BRONZE FITTED	
CP-5	BELL & GOSSETT SERIES 60	HORIZONTAL INLINE	FAN COILS CHS/CHR	65	47*	2	208/3	BRONZE FITTED	
CP-6	BELL & GOSSETT SERIES PR	DOMESTIC CIRCULATION	DOMESTIC HW	10	14'	1/6	115/1	ALL BRONZE	

7

		1 (OIL	. 5	CHE	DUL	.E							
			_	OIL						TING PE	RFORMAI			
SYMBOL	AREA SERVED	CFM	SIZE FPM	ROWS FPI	FEEDS PASSES	AIR PD, IN	CAP. MBH	GPM	WATER WATER PD, FT	EWT	LWT	EDB	SIDE	REMARKS
HC-103A	OFFICE/COAT	230	12x9 350	2 8	1 10	0.10	7.5	0.5	0.1	200	170	55	85	
HC-103B	SITTING, LIBRARY	1140	20x16 500	1 10	5 2	0.10	37.3	2.5	0.1	200	170	55	85	
HC-103C	ENTRY	680	16x13 500	1 8	1 8	0.10	22.2	1.5	0.1	200	170	55	85	
HC-104A	PARLOR, HALL	1340	24x16 500	1 8	5 2	0.10	43.8	3.0	0.1	200	170	55	85	
HC-104B	SUN ROOM, BREEZE WAY	1360	24x16 500	1 8	5 2	0.10	44.4	3.0	0.1	200	170	55	85	
HC-201A	FAMILY ROOM	660	19x10 500	1 8	1 6	0.10	21.6	1.5	0.5	200	170	55	85	
HC-201B	KITCHEN	440	12x10 503	1 8	1 6	0.10	14.3	1.0	0.2	200	170	55	85	
HC-201C	MASTER BEDROOM	300	11x8 500	1 8	1 6	0.10	9.8	1.0	0.1	200	170	55	85	
HC-202A	OFFICE	310	12x9 420	1 8	1 6	0.10	10.1	1.0	0.1	200	170	55	85	
HC-202B	BEDROOM	320	12x9 430	1 8	1 6	0.10	10.5	1.0	0.1	200	170	55	85	
HC-202C	BEDROOM	410	12×10 500	1 8	1 6	0.10	13.3	1.0	0.2	200	170	55	85	
HC-202D	BEDROOMS	780	16x15 500	1 12	1 6	0.10	25.6	2.0	0.9	200	170	55	85	

	MISCELLANEOUS EQUIPMENT SCHEDULE												
SYMBOL	ITEM DESCRIPTION	AREA SERVED	EQUIPMENT CAPACITY	POWER	TRICAL VOLTS/PH	REMARKS							
AS-1	AIR SEPARATOR	HWS/HWR HEATING SYSTEM	198 GPM MIN, 4' PD. MAX	-	- VOLIS/PR	4" CONNECTIONS W/ STRAINER							
4 <u>4</u> 244	HEAT EXCHANGER	HWS/HWIR HEATING SYSTEM	170 EWI, 200 EWI, 4 FD W 190 GFM	uu	mm	SHELL & TUBE TYPE, ASME							
WH-1	WATER HEATER	DOMESTIC HW	2 PSIG © 250° F ENT. STEAM 50° EWT, 120° LWT, 137 GPH 125 GALLON TANK, 24° Ø	-	-	STEAM/HW, HX & TANK TYPE ASME STAMPED, DOUBLE WALL							
H-1	KICK SPACE HEATER	MASTER BATHROOM	2430 BTU/HR OUTPUT @ 140° HWS, 1 GPM, 65° EAT, 36 CFM	0.5 FLA	11511	W/ FAN SPEED SWITCH, FOR USE W/ WALL ①							





3



3601 20th street east suite 2 6 tacoma, wa. 98424 tel: 253.922.9037 fax: 253.922.6499

Mansion Rehabilitation 7 Project

Olympia, WA

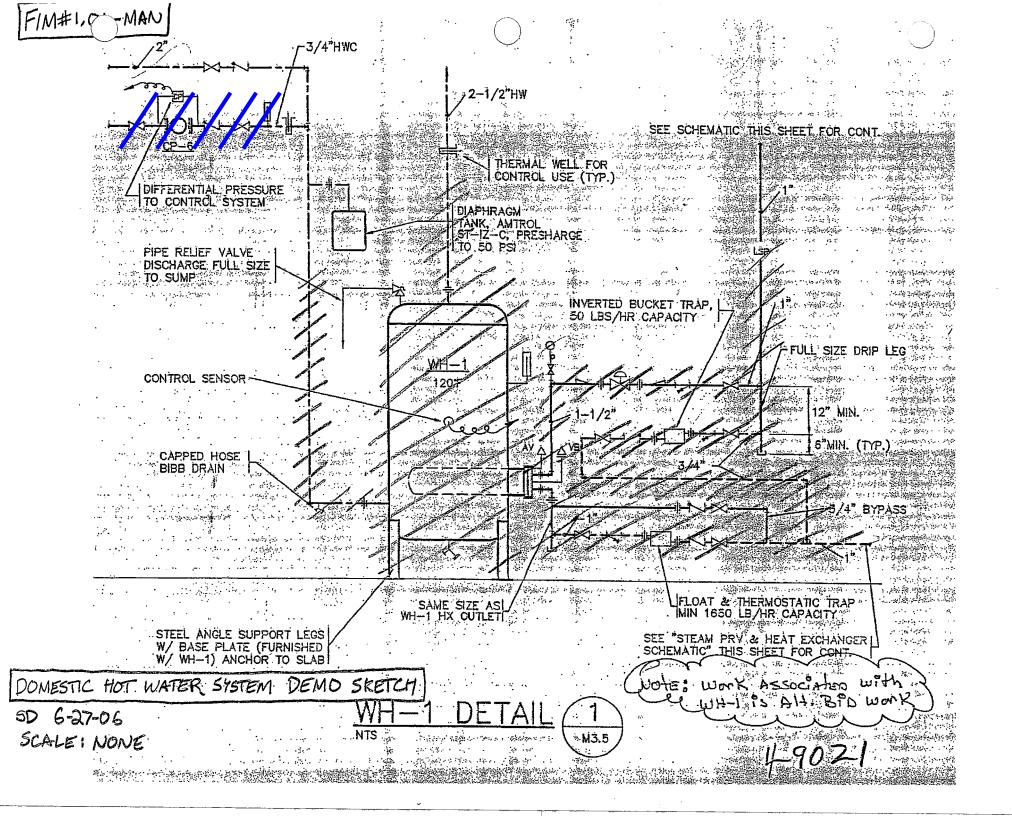
Mechanical Schedules

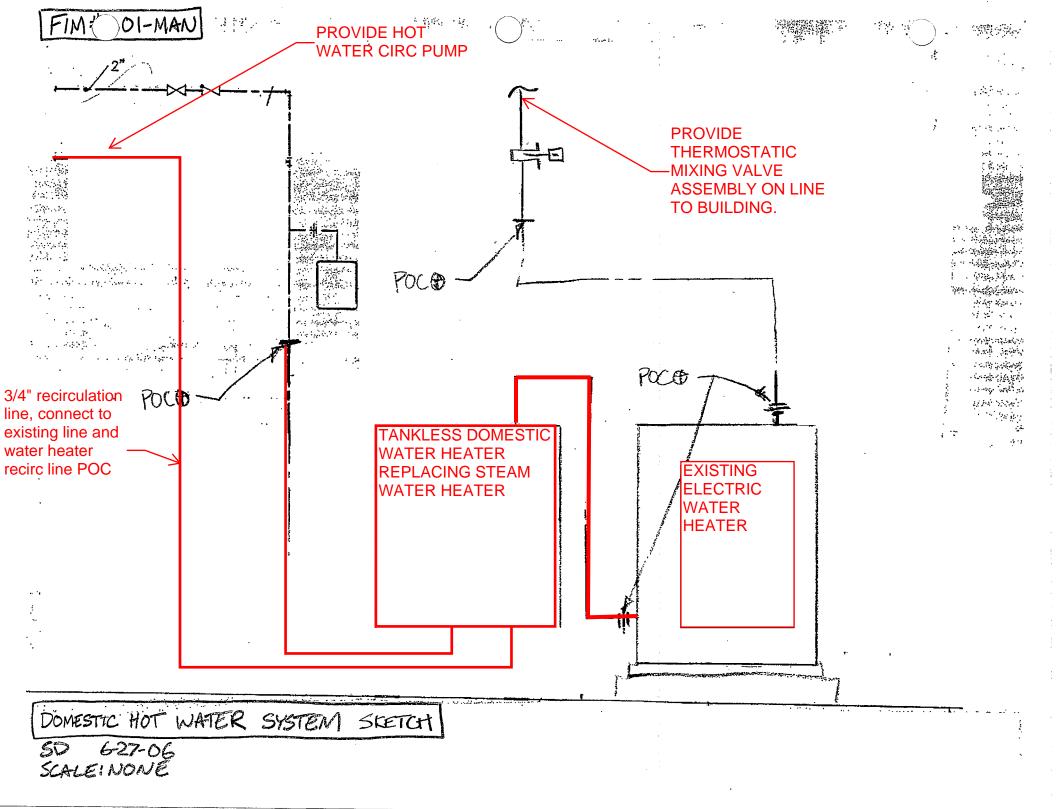
drown: HEB reviewed: MT date job 04/17/00 990

BID SET

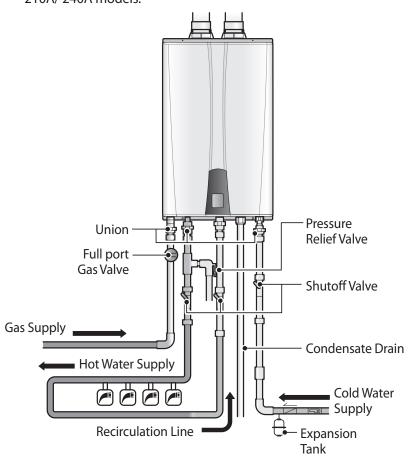
M1.2

drawing no.





• The following is a typical water piping example for NPE-180A/210A/240A models.



[NPE-180A/ 210A/ 240A]

5.5 FIM'S CONSIDERED BUT NOT USED

The following FIM's were considered but are not recommended at this time:

02 PROVIDE DECENTRALIZED CHILLER

The scope of this measure includes providing an air cooled chiller to serve the Mansion and removing the chilled water service fed by the central chiller plant.

This measure is not recommended due to available opportunities to optimize air economizer control and lockout of mechanical cooling. Past improvements to the chilled water plant, as well as high installation costs make this a long payback measure. It is our recommendation that the existing cooling demands be addressed first. Energy savings can be realized by adjusting scheduling and temperature setpoints. Mechanical cooling can be locked-out or limited until scheduled events require additional cooling.

03 PROVIDE GROUND SOURCE HEAT PUMP SYSTEM

The scope of this measure includes providing a ground source heat pump system, including well field, circulation pumps, ground source heat pumps, and appurtenances.

This measure is not recommended due to the long payback period and construction related impacts to Mansion access and landscaping. The thermal wells would be drilled in the front lawn of the site. Geothermal heat transfer would provide savings over traditional production methods, but the initial cost to convert the systems make this measure not financially viable.

06 WATER CONSERVATION

The scope of this measure includes retrocommissioning of the existing water fixtures, including lavatories, water closets, and showers.

This measure would provide utility cost by reducing water consumption; however, we believe the facility would be better served by replacing the existing fixtures when they reach the end of their useful life. Relatively low fixture use provide for a lower potential utility savings.

10 REDUCE POWERHOUSE STEAM SYSTEM PRESSURE

The scope of this measure includes a reduction in the Powerhouse steam plant pressure setpoint.

This measure is not included in the project scope due to the ability of facilities personnel to self-perform this measure. Our recommendation is to not include this work in the energy services project; however, as a viable energy savings initiative, it is recommended to pursue this measure internally with B&G Staff.

11 PROVIDE INSULATION IN ATTIC

The scope of this measure includes providing attic insulation above the level 3 ceiling.

This measure is not included in the project scope due to the ability of facilities personnel to self-perform this measure. Our recommendation is to not include this work in the energy services project; however, as a viable



energy savings initiative, it is recommended to pursue this measure internally with B&G Staff.

12 PROVIDE BUILDING WEATHERIZATION

The scope of this measure includes sealing gaps in the building envelope.

This measure is not included in the project scope due to the ability of facilities personnel to self-perform this measure. Our recommendation is to not include this work in the energy services project; however, as a viable energy savings initiative, it is recommended to pursue this measure internally with B&G Staff.

14 UPGRADE DRYER

The scope of this measure includes replacement of the existing clothes-dryer and cleanout of the dryer exhaust duct.

This measure is not included in the project scope due to the ability of facilities personnel to self-perform this measure. Our recommendation is to not include this work in the energy services project; however, as a viable energy savings initiative, it is recommended to pursue this measure internally with B&G Staff.

15 SOLAR PANEL INSTALLATION

The scope of this analysis included looking into solar photovoltaic panels for electrical generation and solar thermal panels for hot water heating.

This measure is not recommended due to the long payback period, and common purpose of other measure. The payback period for both options is longer than the expected life of the equipment. The hot water demand is being served by other measure.

16 NATURAL GAS FIREPLACE INSERTS

The scope of this measure includes installing gas-fired inserts for the existing fireplaces.

This measure is not included in the final project recommendations, but it is considered a viable measure for inclusion later in the project. The measure was not fully developed at the time of the ESP publication. A rough order of magnitude estimate has been noted in the allotment section of Table 4.1 – Budget Summary for further discussion later in the project.



5.6 UTILITY DATA

UTILITY DATA ANALYSIS

ENERGY USE INDEX ANALYSIS

ENVIRONMENTAL IMPACT

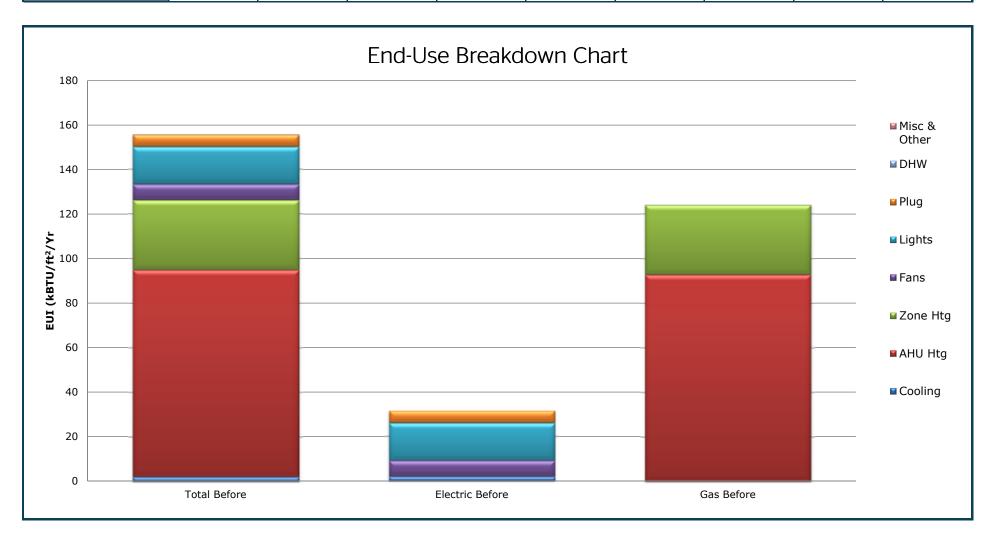


McK8760 - End-Use Breakdown

O1 Provide Decentralized Boiler



EUI By Category	Cooling	AHU Htg	Zone Htg	Fans	Lights	Plug	DHW	Misc & Other	Total
Total Before	2.11	92.81	31.32	7.11	16.78	5.53	0.12	0.00	155.77
Electric Before	2.11	0.00	0.00	7.11	16.78	5.53	0.00	0.00	31.52
Gas Before	0.00	92.81	31.32	0.00	0.00	0.00	0.12	0.00	124.25



	Point ID.484 / Mansion Chilled Water				
		Maximum	Minimum	Average	
Time interval	Total(Btu)		(Btu/h)		
5/1/2012 - 5/31/2012	NULL	NULL	NULL	NULL	
6/1/2012 - 6/30/2012	NULL	NULL	NULL	NULL	
7/1/2012 - 7/31/2012	NULL	NULL	NULL	NULL	
8/1/2012 - 8/31/2012	6,869,892.32	1,398,796.88	0	178,438.76	
9/1/2012 - 9/30/2012	114,126,034.28	1,846,411.88	0	158,728.84	
10/1/2012 - 10/31/2012	29,190,456.04	1,715,857.50	0	39,234.48	
11/1/2012 - 11/30/2012	2,837,832.27	241,792.03	0	3,938.84	
12/1/2012 - 12/31/2012	1,145,171.48	1,539.21	1,539.21	1,539.21	
1/1/2013 - 1/31/2013	1,145,171.48	1,539.21	1,539.21	1,539.21	
2/1/2013 - 2/28/2013	1,033,578.83	1,539.21	1,539.21	1,539.21	
3/1/2013 - 3/31/2013	1,131,318.60	1,539.21	1,539.21	1,539.21	
4/1/2013 - 4/30/2013	12,651,386.12	578,169.38	0	17,571.37	
Total	170,130,841.43	1,846,411.88	0	44,896.57	

	Point ID.8686 / Mansion kW				
		Maximum	Minimum	Average	
Time interval	Total(kWh)		(kW)		
5/1/2012 - 5/31/2012	NULL	NULL	NULL	NULL	
6/1/2012 - 6/30/2012	NULL	NULL	NULL	NULL	
7/1/2012 - 7/31/2012	NULL	NULL	NULL	NULL	
8/1/2012 - 8/31/2012	204.32	30	19.25	23.35	
9/1/2012 - 9/30/2012	17,293.29	43.02	14.89	24.05	
10/1/2012 - 10/31/2012	18,198.43	51.58	14.39	24.46	
11/1/2012 - 11/30/2012	17,843.39	48.23	15.66	24.75	
12/1/2012 - 12/31/2012	20,673.98	53.94	15.42	27.79	
1/1/2013 - 1/31/2013	20,736.58	61.02	15.55	27.87	
2/1/2013 - 2/28/2013	16,330.57	51.62	13.48	24.32	
3/1/2013 - 3/31/2013	17,666.90	50.7	13.17	24.04	
4/1/2013 - 4/30/2013	17,321.60	45.45	14.42	24.06	
Total	146,269.05	61.02	13.17	24.97	

WA Governor's Residence 2013





NWPP	Select e	GRID S	Subregion	0.82340	lbs CO ₂ e/kWh (eGRID Subregion Electric	city Emissions Factor)		
Amount Each	Amount Each Utility Type Will Be Reduced Per Year							
Electricity								
46,210	kWh	=	38,050 lbs	CO ₂	17.3 Metric Tonnes CO ₂	This Annual Emis	ssions Reduction Is Equivalent To The Following:	
Natural Gas						22	Number of Vehicles Removed From Roads (Avg Size); or	
18,493	Therms	=	216,498 lbs	CO ₂	98.2 Metric Tonnes CO ₂	431,436	Number of Miles Not Driven Per Year (Avg Size); or	
Steam						3,182	Number of 75 Watt Light bulbs Not Energized; or	
0	Mlbs	=	0 lbs	CO ₂	0.0 Metric Tonnes CO ₂	11	Number of Avg Sized Houses Removed From Power Grid; or	
Fuel Oil						32	Acres of Trees Planted; or	
0	Gallons	=	0 lbs	CO ₂	0.0 Metric Tonnes CO ₂	118,947	Pounds of Coal Not Burned <u>Per Year</u>	
Propane								
0	Gallons	=	0 lbs	CO ₂	0.0 Metric Tonnes CO ₂			
Tota	I Reduction	=	254,547 lbs	CO ₂	115.5 Metric Tonnes CO ₂			

Other Emissions Factors

Natural Gas: 11.707 lbs CO₂ / Therm

Steam: 195.3636 lbs CO₂ / Mlbs (Seattle Steam)

Fuel Oil: 22.384 lbs CO₂ / gal Propane: 12.5 lbs CO₂ / gal

Conversion: 2,204.623 lbs CO₂ / Metric Tonnes CO₂

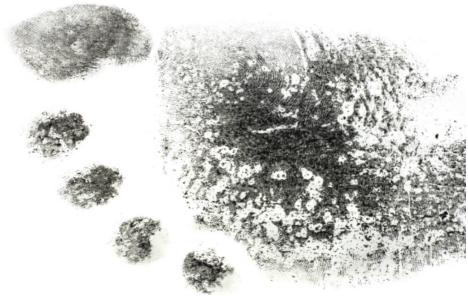
Equivalents Conversions

Car Emmissions: 11,470 lbs CO₂ / car / yr Tree Carbon Sequestation: 8,066 lbs CO₂ / acre / yr Vehicle Mileage Emmissions: 0.59 lbs CO₂ / mile 75 W Light Bulb Emmissions: 80 lbs CO₂ / Light Bulb / yr Tree Carbon Sequestation: 8,066 lbs CO₂ / acre / yr

Coal Emmisions: 2.14 lbs CO₂ / pound Coal Houses Removed: 22,880 lbs CO₂ / house

Sources:

- * Energy Information Agency (EIA)
- * Environmental Protection Agency (EPA)
- * ENERGY STAR
- * eGRID



5.7 HVAC SYSTEM DATA & TEST TRENDS



Page 1

Page 1

Page 1



Project: GA Steam Plant Summer Shutdown	Job No. P10607	Page		
Description:		1		
FIM 01.01-MAN: Provide Hot Water Boiler or Heat Pump System				
Existing Power House Steam System Efficiency		MRN		

Date 6/6/2006

Direct Meter Reading with Only HP Steam Lines Active (No Loads):

Meter start time: 9/24/2004 15:48 9/26/2004 19:45 Meter end time:

Time between meter readings: 51:57:00 (H:M:S) -

Direct Gas Meter Readings During Above Time (No Loads):

				Consumptio	n
	Start	End	CCF	BTU	Therms
South	41,890	42,818	928	92,800,000	928
North	72,691	73,713	1,022	102,200,000	1,022

Total: 1,950 Therms

Standby Natural Gas Usage:

Standby gas input: 1,950 Therms / 51 H : 57 S =

37.5 Therms/hour

Historical Utility Data, Capitol Campus Total Natural Gas Time

	Natural Gas	Time	Time	Standby Gas	Useful	Average
	Use	Between	Between	Use	Consumption	Total
Month	(Therms)	Readings	Readings	(Therms)	(Therms)	Efficiency
	,	(H:M:S)	(H)	,	,	,
Mar-04	60,360	,	,			
Apr-04	55,830	744:00:00	744	27,927	27,903	50.0%
May-04	56,722	720:00:00	720	27,026	29,696	52.4%
Jun-04	54,230	744:00:00	744	27,927	26,303	48.5%
Jul-04	63,243	720:00:00	720	27,026	36,217	57.3%
Aug-04	86,405	744:00:00	744	27,927	58,479	67.7%
Sep-04	59,001	744:00:00	744	27,927	31,074	52.7%
Oct-04	68,780	720:00:00	720	27,026	41,754	60.7%
Nov-04	85,063	744:00:00	744	27,927	57,136	67.2%
Dec-04	94,992	720:00:00	720	27,026	67,966	71.5%
Jan-05	87,871	744:00:00	744	27,927	59,944	68.2%
Feb-05	79,048	744:00:00	744	27,927	51,121	64.7%
Mar-05	79,777	672:00:00	672	25,224	54,553	68.4%
Apr-05	72,564	744:00:00	744	27,927	44,637	61.5%
May-05	64,922	720:00:00	720	27,026	37,896	58.4%
Jun-05	63,308	744:00:00	744	27,927	35,381	55.9%
Jul-05	64,958	720:00:00	720	27,026	37,932	58.4%
Aug-05	61,298	744:00:00	744	27,927	33,371	54.4%
Sep-05	55,869	744:00:00	744	27,927	27,942	50.0%
Oct-05	64,437	720:00:00	720	27,026	37,411	58.1%
Nov-05	81,581	744:00:00	744	27,927	53,654	65.8%
Dec-05	102,510	720:00:00	720	27,026	75,484	73.6%
Jan-06	96,386	744:00:00	744	27,927	68,459	71.0%
Feb-06	92,884	744:00:00	744	27,927	64,957	69.9%
Year 1	851,545	8088:00:00	8,088	303,592	487,593	60.1%

5.8 AUGUST 2013 INVESTMENT GRADE AUDIT REPORT



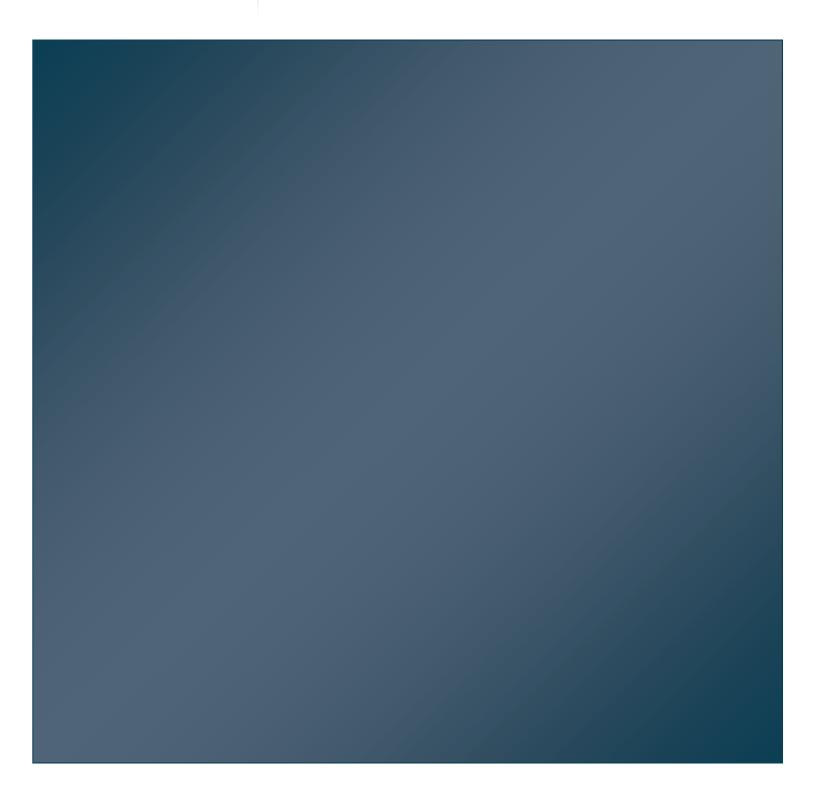


Governor's Residence

Department of Enterprise Services - Investment Grade Energy Audit Update Report

PRELIMINARY DRAFT

OLYMPIA, WA 27 AUG 2013



Contents

SECTION 1. EXECUTIVE SUMMARY

SECTION 2. FACILITY INFORMATION

- 2.1 Facility Overview
- 2.2 Facility Facts
- 2.3 Facility Description

SECTION 3. UTILITY DATA

- 3.1 Utility Overview
- 3.2 Meter and Energy Model Data
- 3.3 Energy End-Use Breakdown

SECTION 4. APPENDICES

- 4.1 Table 3.1 Energy Savings Summary
 4.2 Table 3.2 M&V Plan Outline
 4.3 Table 4.2 Facility Improvement Measure (FIM) Summary
- 4.4 PSE Schedule 258 Competitive Phase Proposal



1. Executive Summary

August 27, 2013

Marygrace Jennings Asset Manager Governor's Residence Ron Major Energy Engineer / RCM WA State Capitol Campus

Subject: Investment Grade Energy Audit Update Report

WA Department of Enterprise Services

Dear Marygrace / Ron:

This report describes the Investment Grade Energy Audit (IGA) that is in progress for the Governor's Residence. The intent of this study is to identify energy saving upgrades opportunities and to address infrastructure modifications necessary to remove the Governor's Residence from the campus distributed steam and chilled water systems. Included in this report is a description of the energy systems in the audited facility and existing energy usage summary charts, along with recommendations for implementation. Also included in the appendix are preliminary budget and energy savings: Table 3.1 – Energy Savings Summary; Table 3.2 – M&V Plan Outline; and Table 4.2 – Facility Improvement Measure (FIM) Summary. These proposed values are based on data gathered and a preliminary basis of design. Once direction is given by the owner team, we will finalize the estimate and energy savings calculations.

The Facility Improvement Measures are listed below, along with the recommendation for further development. Implementation Costs and Proposed Savings for each measure are given below. The total FIM Costs are given for 'Recommended' and 'Not Recommended' measures. These are preliminary estimates, not final guaranteed values. Only the material costs are given for the 'Opportunities for Future Consideration' to give the facility an idea of budget cost, if self-performed.

RECOMMENDED MEASURES FOR ENERGY SERVICES PROJECT

1. Provide Decentralized Boiler: This measure removes the site heating load from the central steam plant. Decoupling the Governor's Residence from the distributed steam system will allow the site and campus to operate independently based on specific schedules and setpoints. This would be part of achieving a summer shutdown of the central plant.

Energy savings will be achieved through higher combustion efficiency and a reduction of transmission losses through the lengthy steam and condensate piping runs.

FIM COST: \$273,186 UTILITY+O&M SAVINGS: \$5,108 UTILITY REBATES: \$0

2. Provide Demand Controlled Ventilation: This measure incorporates feedback from building zones with regard to occupancy (CO₂ levels), and provides appropriate outside air ventilation to match occupancy levels. This measure would reduce energy loss due to air leakage at exterior windows and doors.

Energy savings are realized through reduced conditioning of outside air.

FIM COST: \$33,155 UTILITY+O&M SAVINGS: \$6,051 UTILITY REBATES: \$15,000



1. Executive Summary

3. Interior Lighting Upgrade: The intent of this measure is to replace incandescent lamps with LED equivalent lamps and upgrade old linear fluorescent fixtures with higher efficiency lighting.

Energy savings will be achieved through more efficiency lighting technologies. Operational savings will be achieved through longer lamp life, and therefore a longer re-lamp cycle.

FIM COST: \$28,338 UTILITY+O&M SAVINGS: \$1,785 UTILITY REBATES: \$8,993

4. Exterior Lighting Upgrades: The intent of this measure is to upgrade the existing HID lighting with LED equivalent lamps.

Energy and operational savings will the similar to the interior lighting upgrades. FIM COST: \$44,025 UTILITY+O&M SAVINGS: \$862 UTILITY REBATES: \$6,222

5. Provide Domestic Hot Water Heater: This measure will replace the existing domestic water heater with a high efficiency, condensing and instantaneous domestic water heater. This measure will be necessary if the building is taken off of the campus steam. The existing water heater is served by steam.

Energy savings will be realized by increased combustion efficiency and reduction of transmission and standby losses.

FIM COST: \$23,908 UTILITY+O&M SAVINGS: \$128 UTILITY REBATES: \$800

OPPORTUNITIES FOR FUTURE CONSIDERATION

The costs for these items are given as material costs only (WSST not included) to represent implementation using facility staff. If the measures are to be included in an Energy Services project, additional costs for labor, design, performance assurance, etc. will be included. Estimated utility savings are based on McKinstry calculations, and may differ from vendor estimates.

 Upgrade Single Pane Glazing: This measure would install interior storm windows with low-e glazing to existing windows. Storm windows will reduce solar gain and increase thermal insulation. The material and installation costs would provide a relatively low return on investment, but it may still be beneficial to further develop this measure. Facility staff could self-perform this work.

MATERIAL COST: \$20,407 UTILITY SAVINGS: \$700 UTILITY REBATES: \$0

2. Provide Insulation in Attic & Building Weatherization: This measure would install insulation in the attic and crawl spaces throughout the Residence, and perform air sealing to exterior walls, doors, and windows. This measure would reduce heating and cooling costs, and improve occupant comfort; however, we believe that improving the control of building pressurization through optimization of the outside air ventilation will provide greater energy savings. It is our recommendation to proceed with the Demand Controlled Ventilation measure as part of the ESCO project. The weatherization measure could be accomplished by facilities staff.

MATERIAL COST: \$74,403 UTILITY SAVINGS: \$275 UTILITY REBATES: \$400



1. Executive Summary

3. Water Conservation: This measure would replace existing water fixtures with low-flow devices. It would save utility costs by reducing water consumption; however, we believe the facility would be better served by replacing the existing fixtures when they reach the end of their useful life. Relatively low fixture use keep the potential utility savings low.

MATERIAL COST: \$8,222 UTILITY SAVINGS: \$564 UTILITY REBATES: \$1,400

4. Upgrade Dryer: This measure would replace the existing clothes dryer with a new high efficiency model and provide clean-out of the existing dryer duct. Energy costs will be realized by reduced dryer run times. It is recommended that facility staff perform the dryer vent clean-out and replace the dryer in-house.

MATERIAL COST: \$1,000 UTILITY SAVINGS: \$100 UTILITY REBATES: \$0

NOT RECOMMENDED AT THIS TIME

Provide Decentralized Chiller: This measure would install an air-cooled chiller, near the
existing generator, to provide chilled water for the fan coils serving the building. Past
improvements to the chilled water plant, as well as high installation costs make this a long
payback measure. It is our recommendation that the existing cooling demands be
addressed first. Energy savings can be realized by adjusting scheduling and temperature
setpoints. Mechanical cooling can be locked-out or limited until scheduled events require
additional cooling for the facility.

FIM COST: \$273,186 UTILITY+O&M SAVINGS: \$5,108 UTILITY REBATES: \$0

2. Provide Ground-Source Heat Pump System: This measure would install a ground-source heat pump loop to replace the campus steam and chilled water system. The thermal wells would be drilled in the front lawn of the site. Geothermal heat transfer would provide savings over traditional production methods, but the initial cost to convert the systems make this measure not financially viable.

FIM COST: \$2,018,968 UTILITY+O&M SAVINGS: \$10,129 UTILITY REBATES: \$0

We look forward to continuing to work with you on the prioritization of these recommendations, further development of selected measures, and implementation of significant energy efficiency improvements at the Governor's Residence.

Best Regards,

Matthew M. Montagner, PE Program Manager

Man May

McKinstry Energy Services



Washington State Governor's Residence



Facility Facts:

Washington State Governor's Residence

Capitol Campus

Olympia, WA



Energy Use Index (kBtu/ft²/yr)	205.0
Energy Cost Index (\$/ft²/yr)	\$2.68
Area (ft²)	20,128
Year Built	1908
Occupancy Class	R3
Estimated Number of Personal Computers	N/A
Average Elec. Load Factor	N/A
Total Utility Cost (\$/vr)	\$54,000

	Hours of Operation	Facility Use Description
Monday	24 HPD	The Governor's Residence serves as the primary residence for the Wshington State Governor. The first floor of the residence is dedicated to
Tuesday	24 HPD	hosting state events and functions. The second and third floors provide
Wednesday	24 HPD	private living areas and guest rooms.
Thursday	24 HPD	General Facility Notes
Friday	24 HPD	As a residence, the facility operations under continual use. The building HVAC systems maintain 70 - 74 deg F space temperature.
Saturday	24 HPD	110/16 Systems maintain 70 74 deg i space temperature.

Heating, Ventilation & Air Conditioning (HVAC) Equipment			
System	Equipment Description	Notes	
Cooling:	Chilled Water Cooling Coils	Chilled Water supplied by Campus Central Plant	
Heating:	Steam to Hot Water Heat Exchanger Heating Hot Water Coils & Fin-Tube Heaters	Steam supplied by Campus Central Plant	
Air Dist:	(8) Fan Coil Units	Units Located in Basement and 4th Floor Storage Space	

Heating, Ventilation & Air Conditioning (HVAC) Controls			
Item Equipment Description		Notes	
HVAC Controls:	2000 - Johnson Controls	Metasys Control System	

Lighting System			
Item	Equipment Description	Notes	
	Incandescent Canned Lights	Mixed Throughout Facility	
Fixture Type:	Compact Fluorescent	Mixed Throughout Facility	
	Decorative Chandeliers	1st Floor	

Other Facility Information			
Roofing:	Composite, Metal	Windows:	Single-Pane,Wood Frame
Walls:	Brick	# of Floors:	Four
Water Fixtures:	Non-Low Flow	Irrigation:	Controlled
Other:		Other:	

2. Facility Information

2.3 Facility Description

Building Description

The Washington State Governor's Residence (Figure 1) is located on the Capitol Campus in Olympia Washington, just west of the Legislative Building. The first floor of the Residence is dedicated to hosting State events and functions and is a public space. The remainder of the Residence holds private residence areas and staff support services. The Governor's Residence was originally built in 1908 and is primarily constructed of red brick, wood and plaster.



Figure 1 - Building Exterior

Steam and Heating Hot Water

Currently, the main campus steam system provides steam to the Governor's Residence for all hours of demand. The campus steam serves a converter (upper background of Figure 2) that provides heating hot water for the building's air handlers and perimeter hot water radiators. It was found that the converter is significantly over-sized by at least a factor of two. Two circulation pumps (CP-1 and CP-3) serve the two building hot water loops. CP-1 serves the air handler coils and CP-3 serves the perimeter fin-tube radiant system. Each loop has a redundant pump (CP-2, shown in Figure 2 and CP-4). The perimeter fin-tube system runs at a lower temperature than the air handler coils and is controlled by a 3-way mixing valve. The air handler loop operates at the converter supply water temperature.



Figure 2 – Basement Mechanical Room

Chilled Water

Currently, the main campus chilled water system provides chilled water to the Governor's Residence for all hours of demand. Building chilled water circulation pump, CP-5 operates based on demand from the building air handler coils. One aspect of this study focused on the feasibility of disconnecting the Governor's Residence from the main campus steam and chilled water systems, to allow for shut down of the Powerhouse systems when not needed outside of regular office hours.



2. Facility Information

HVAC System

The current HVAC system was reconfigured in 2000 and provided new air handlers to serve the Governor's Residence. Each air handler has a heating hot water and chilled water coil. The perimeter is served by hot water fin-tube radiant heaters.

Domestic Hot Water

Domestic hot water is provided by an AO Smith hot water heater (Figure 3), served by campus steam. An electric domestic hot water heater provides backup domestic hot water when steam is not available or the primary heater is being serviced.



Figure 3 – Steam Water Heater

Appliances

The kitchen appliances, including a commercial-style gas range top and fume hood, refrigerator, and three dishwashers are relatively efficient. The gas range has electronic ignition instead of pilot lights. The fume hood is switched and used only when needed.

The clothes washer is new and in good condition. The clothes dryer is approaching the end of its useful life and should be replaced soon.

Lighting

The building lighting includes a large number of incandescent light fixtures in specialty applications (Figure 4). Advances in technology have created energy efficient retrofit opportunities using LED technology for many of these applications. This represents a good energy savings opportunity. There is also some limited opportunity to apply lighting controls.



Figure 4 – Interior Lighting



2. Facility Information

Water Fixtures

Restroom water fixtures are general not low flow/high efficiency models. There is opportunity to upgrade toilets and replace aerators and showerheads to conserve water.

Building Envelope

Opportunity to reduce infiltration through weatherization and installation of storm windows was identified through blower door testing utilizing multiple blower door units (Figure 5). There is also improvement opportunity by adding to existing attic insulation.



Figure 5 - Blower Door Test



3. Utility Data

3.1 Utility Overview

The table below represents a utility summary for the facility. The charts on the following pages contain more detailed breakdowns of existing energy usage profiles. The facility is served by the main Capitol Campus utility meters. Some submetering data was also available for facility-specific review. In addition to meter data, the facility energy consumption was modeled using audit data and software tools for comparison. The metered steam (generated by natural gas combustion) and electricity usage matched very closely with the energy model. Water utility data was not available at the time of this report.

#	Facility Name	Electricity Usage (kWh/year)	Steam Usage (Natural Gas Therms/year)	Chilled Water (kBtu/year)	Total Estimated Cost of Energy Utilities (\$/year)
1	Washington State Governor's Residence	203,867	31,971	237,666	\$54,000

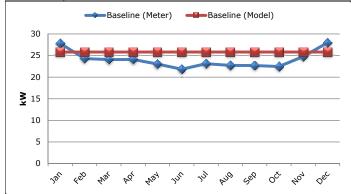


Governor's Residence Electric, Steam, and Chiller Water Usage Data



0.35

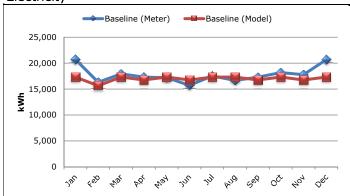
Electricity Demand



Month	Baseline (Meter)	Baseline (Model)	Proposed (Model)
Jan	28	26	26
Feb	24	26	26
Mar	24	26	26
Apr	24	26	26
May	23	26	26
Jun	22	26	26
Jul	23	26	26
Aug	23	26	26
Sep	23	26	26
Oct	22	26	26
Nov	25	26	26
Dec	28	26	26
Total	289	310	310
			,
% Delta Between Base	(Model)	7%	

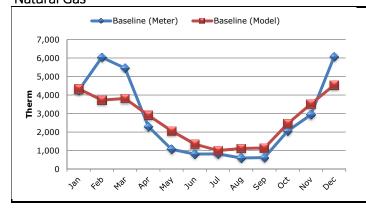
RSQ (Correlation Coefficient)

Electricity



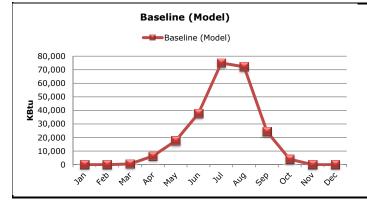
Month	Baseline (Meter)	Baseline (Model)	Proposed (Model)
Jan	20,707	17,315	17,315
Feb	16,308	15,639	15,639
Mar	17,931	17,315	17,315
Apr	17,314	16,756	16,756
May	17,195	17,315	17,315
Jun	15,724	16,756	16,756
Jul	17,523	17,315	17,315
Aug	16,660	17,315	17,315
Sep	17,297	16,756	16,756
Oct	18,176	17,315	17,315
Nov	17,781	16,756	16,756
Dec	20,681	17,315	17,315
Total	213,297	203,867	203,867
% Delta Between Ba	(Model)	-5%	
RSQ (Correlation Co.	0.24		

Natural Gas



Month	Baseline (Meter)	Baseline (Model)	Proposed (Model)					
Jan	4,248	4,337	4,337					
Feb	6,037	3,727	3,727					
Mar	5,454	3,815	3,815					
Apr	2,300	2,900	2,900					
May	1,069	2,069	2,069					
Jun	812	1,353	1,353					
Jul	820	1,003	1,003					
Aug	600	1,114	1,114					
Sep	620	1,145	1,145					
Oct	2,058	2,451	2,451					
Nov	2,931	3,518	3,518					
Dec	6,069	4,540	4,540					
Total	33,018	31,971	31,971					
	eline (Bills) & Baseline	(Model)	-3%					
RSQ (Correlation Coef		0.84						

Chilled Water



Month	Baseline (Bills)	Baseline (Model)	Proposed (Model)
Jan	0	0	0
Feb	0	0	0
Mar	0	487	0
Apr	0	6,261	0
May	0	17,580	0
Jun	0	37,741	0
Jul	0	74,992	0
Aug	0	72,227	0
Sep	0	24,389	0
Oct	0	3,989	0
Nov	0	0	0
Dec	0	0	0
Total	0	237,666	0

McK8760 - End-Use Breakdown





EUI By Category	Cooling	AHU Htg	Zone Htg	Fans	Lights	Plug	DHW	Misc & Other	Total
Total	3.59	143.46	5.79	7.11	13.77	8.91	0.15	2.74	185.50
Electric	3.59	0.00	0.00	7.11	13.77	8.91	0.00	2.74	36.10
Gas	0.00	143.46	5.79	0.00	0.00	0.00	0.15	0.00	149.40
Steam Before	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Steam After	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

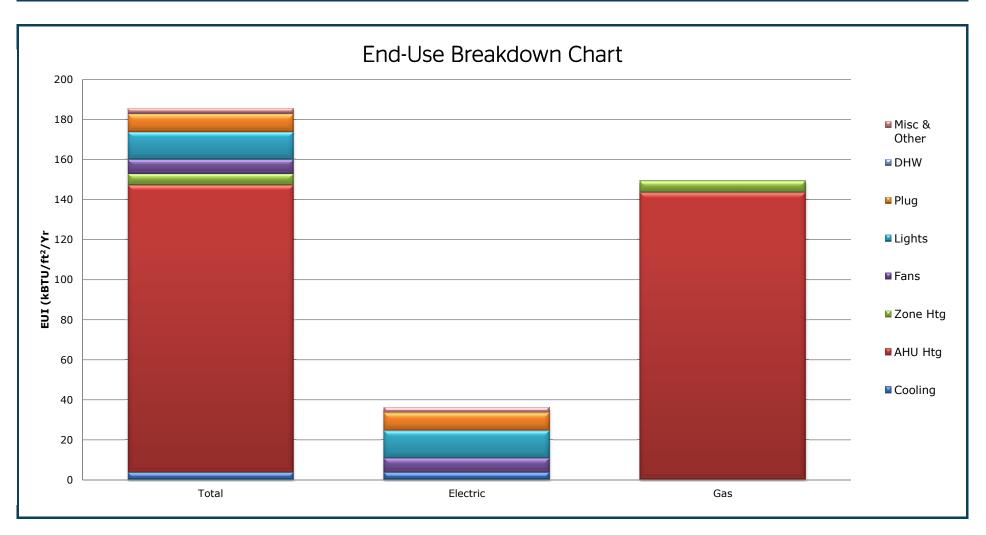




Table 3.1 - Energy Savings Summary

Project WA Governor's Residence 2013

Scenario Pre-Final Date 7/31/2013

	-			Electricity			Natural Gas		Total **	
Category	Facility Improvement Measures	Facility	Net Effective Guarantee Multiplier *	kW	kW (\$)	kWh	kWh (\$)	Therm	Therm (\$)	(\$)
1 - Heating / Cooling Source	01 Provide Decentralized Boiler	WA Governor's Residence	90.0%	0.0	\$0	0	\$0	7,590	\$5,108	\$5,108
2 - Energy Management Control System (EMCS)	08 Provide Demand Controlled Ventilation	WA Governor's Residence	90.0%	17.1	\$61	338	\$18	8,874	\$5,973	\$6,051
4 - Lighting Upgrades	09.01 Interior Lighting Upgrade	WA Governor's Residence	89.5%	91.8	\$325	16,187	\$863	-55	-\$37	\$1,151
4 - Lighting Upgrades	09.02 Exterior Lighting Upgrades	WA Governor's Residence	89.4%	36.9	\$131	11,200	\$597	-39	-\$26	\$702
5 - Domestic Water Measures	13 Provide Domestic Hot Water Heater	WA Governor's Residence	90.0%	0.0	\$0	0	\$0	190	\$128	\$128
			Totals ***	145.8	\$516	27,725	\$1,479	16,560	\$11,146	\$13,141

^{*} The savings shown in this table are less than the calculated savings unless a guarantee multiplier of 100% is shown.

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^{**} The guarantee is based on Key Performance Indicators shown in Table 3.2. Refer to Section 3 of the ESP for the method of converting Key Performance Indicators to dollars during the M&V peric

^{***} The guarantee is based on the aggregate savings for all FIMs, not on individual FIM savings.



Table 3.2 - M&V Plan Outline

roject WA Governor's Residence 2013
Genario Pre-Final
Oate 7/31/2013

Dute	7/31/2013						Audit Stage (Baselining)	Post Retrofit (Commissioning)				
FIM Name	Facility	IPMVP Option	KPI	Key Performance Indicators	Baseline Values	Proposed Values	Tasks	Tasks	Remote Alarming and/or Monitoring	Recommended M&V Tasks	Ongoing Owner Responsibilities	Stipulated Factors
01 Provide Decentralized Boiler	WA State Governor's Residence	А	1.	Hours of operation	8,760	8,760	Trend building steam flow, pressure and temperature	Verify air handling unit occupancy schedule as implemented in building management system (BMS)	None proposed.	Verify residence occupancy schedule.	Maintain equipment per manufacturer recommendations	Internal loads and weather conditions, occupancy schedules, setpoints.
	WA State Governor's Residence		2.	Steam system efficiency	65%	N/A	Campus steam system efficiency	Verify steam no longer utilized as a heating source for building space heat	None proposed.	Verify residence occupancy schedule.	Maintain equipment per manufacturer recommendations	Internal loads and weather conditions, occupancy schedules, setpoints.
			3.	Boiler combustion efficiency	N/A	88% @ 140 F RWT	Not present	Provide combustion efficiency test, provide startup, functional performance test (FPT) documents and point-to-point (PTP) documents for boiler.	None proposed.	Perform combustion efficiency test, BMS trend heating water supply temperature, return temperature, supply/return water temperature setpoints, and outside air temperature for 2 week interval to verify temperature control and reset.	Maintain equipment per manufacturer recommendations	Internal loads and weather conditions, occupancy schedules, setpoints.
08 Provide Demand Controlled Ventilation	WA State Governor's Residence	Α	1.	Minimum outside air percentage	25%	8% minimum, varies damper position to maintain supply air CO2 setpoint	Log one OAT and (3) AHU MAT's & RAT's to compute OAT %	Provide FPT and PTP documents for air handling units. Verify minimum airflows as specified in design documents and controls sequences meet project requirements.	Alarm on override of DCV control.	BMS trend outside air temperature, return air temperature, mixed air temperature, discharge air temperature, discharge air temperature, economizer status, and zone occupancy status or return air CO2 concentration and concentration setpoint for sample of air handling units for 2 week interval to verify outside air percentage and proper modulation of economizer dampers to control to zone occupancy or return air CO2 setpoint.	Maintain equipment per manufacturer recommendations	Internal loads and weather conditions, occupancy schedules, setpoints.
09.01 Interior Lighting Upgrade	WA Governors Mansion	А	1.	Light levels	See detailed lighting audit	See detailed lighting audit	Light level survey in sample o spaces	f Light level survey in sample of spaces	None proposed.	None proposed.	Maintain equipment per manufacturer recommendations	Annual operating hours, occupancy levels, and schedules (based on facility staff interview)
			2.	Fixture input power (watts)	See detailed lighting audit	See detailed lighting audit	Site review	Stipulated ANSI values	None proposed.	None proposed.	Maintain equipment per manufacturer recommendations	Annual operating hours, occupancy levels, fixture burn hours, and schedules (based on facility staff interview)
13 Provide Domestic Hot Water Heater	WA State Governor's Residence	А	1.	Domestic hot water tank efficiency	0.4	2.4	Verify nameplate efficiency	Verify that the water heater efficiency as specified in approved submittal documents meet project requirements.	None proposed.	None proposed.	Maintain equipment per manufacturer recommendations	Internal loads and weather conditions, occupancy schedules, setpoints.

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Table 4.2 - Facility Improvement Measure (FIM) Summary

Project

WA Governor's Residence 2013

cenario Pre-Final ate July 31, 2013

Category	Facility Improvement Measures	FIM Description	Facility	Budget *	Annual Utility Savings	Annual Operational Savings **	Potential Incentives ***	Net Customer Cost (with Incentives)
1 - Heating / Cooling Source	01 Provide Decentralized Boiler	The intent of this measure is to provide a hot water boiler to serve the Governor's Residence independently of the campus central steam plant. Existing: A central steam plant currently provides the Governor's Residence with heating energy via a steam converter located within the building basement. The central steam boilers operate 24 hours a day to maintain 120 lb steam pressure within the mains, even during periods of little to no campus heating energy demand. This operation leads to significant standby and transmission losses. Proposed: Provide a condensing boiler dedicated to heating the Governor's Residence, including heating water piping, combustion air and flue ducts, power, controls, and appurtenances. Benefits: Natural gas savings will be realized by replacing the steam service with a natural gas fired condensing boiler, which has greater combustion efficiency and less transmission losses than the central steam plant.	WA State Governor's Residence	\$273,186	\$5,108	\$0	\$0	\$273,186
2 - Energy Management O Control System (EMCS) V	08 Provide Demand Controlled Ventilation	The intent of this measure is to provide CO2 based demand controlled ventilation for the chilled water air handling units serving the occupied areas of the Governor's Residence. Existing: The existing air handling units do not have a means of reducing airflows to match the building occupancy. Proposed: Provide supply or return air based demand controlled ventilation for the chilled water air handling units, including sensors, controls, commissioning, and appurtenances. Benefits: Heating and cooling energy usage associated with the conditioning of ventilation air will be reduced through reducing ventilation rates to match building occupancy.	WA State Governor's Residence	\$33,155	\$6,051	\$0	\$15,000	\$18,155
4 - Lighting Upgrades	09.01 Interior Lighting Upgrade	The intent of this measure is to replace all incandescent lamps with LED equivalent lamps and upgrade old linear fluorescent fixtures. Existing: The existing fixtures use traditional incandescent lamps in a variety of fixture types. These lamps consume higher energy, are inefficient at converting energy into light, and have a lower life expectancy than modern lamp technologies. Additionally, there are several fixtures with older technology linear fluorescent lamps which consume more energy than newer types. Proposed: Replace each incandescent lamp with an LED equivalent and maintain the existing fixture. Lighting controls will remain. The T12 linear fluorescent fixtures shall be retrofitted to T8 lamps and electronic ballasts. Replace T12 undercabinet lighting in the 2nd Floor Kitchen with LED replacements. All existing compact fluorescent 2 and 4-pin connection types will remain. Benefits: LED lighting provides improved efficacy, efficiency, and operational life compared to traditional incandescent lamp types. New, lower wattage T8 linear fluorescent fixtures will produce improved light quality compared to the existing T12, while saving energy.	WA State Governor's Residence	\$28,338	\$1,151	\$634	\$8,993	\$19,345

Category	Facility Improvement Measures	FIM Description	Facility	Budget *	Annual Utility Savings	Annual Operational Savings **	Potential Incentives ***	Net Customer Cost (with Incentives)
4 - Lighting Upgrades	09.02 Exterior Lighting Upgrades	The intent of this measure is to upgrade existing HID lighting with LED equivalent alternatives. Existing: There are several variations of both high pressure sodium and incandescent fixtures that serve the exterior grounds and driveway. Each area of the campus lighting is controlled by either a timeclock or Metasys controls system depending on the location. Proposed: Perform a one-for one LED retrofit or replacement of the selected fixture as indicated within the Lighting Spreadsheet. Lighting Controls scheme will remain. Benefits: LED lighting provides improved efficacy, efficiency, and operational life compared to traditional HID lamp types.	WA State Governor's Residence	\$44,025	\$702	\$160	\$6,222	\$37,803
5 - Domestic Water Measures	13 Provide Domestic Hot Water Heater	Proposed: Provide a condensing domestic water heater including pining expansion tank controls and	WA State Governor's Residence Totals	\$23,908 \$402,613	\$128 \$13,141	\$0 \$794	\$800 \$31,015	\$23,108 \$371,598

Since design cost, audit cost, etc. are distributed among the FIMs, the total project cost will not go up or down by exactly the amounts shown here if a FIM or FIMs are dropped.
 For non recurring operational savings, the values are averaged over the 30 year length of this analysis.
 Incentives are contingent on final approval and are not guaranteed. Funds are shown for reference only.

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July 16, 2013

Mr. Gus Takala Business Energy Management Puget Sound Energy P.O. Box 90868 EST-09E Bellevue, WA 98009-0868

Subject:

Schedule 258 Competitive Phase Proposal

WA State Capitol Campus – Governor's Residence

Dear Gus:

The Department of Enterprise Services is interested in improving the energy efficiency of their existing facilities and has worked with McKinstry to prepare the attached Schedule 258 Competitive Phase Proposal. The proposal contains the following components:

- * Project Information Form.
- 1. Project Description.
- 2. Documentation of Energy Use Baseline (kWh/yr).
- 3. Calculated Energy Savings (kWh/yr) and Peak Demand (kW) Reduction.
- 4. Measure Cost Documentation.
- 5. Funding Analysis.
- 6. Project Timeline.
- 7. Verification Plan.

The target facility (system) is the WA State Governor's Residence, located on the Capitol Campus in Olympia, Washington.

We look forward to working with Puget Sound Energy on this project. Please call should you have any questions.

Best Regards,

Matthew M. Montagner, PE

Man In hay

Program Manager McKinstry Company

cc: Jim Hayes, DES



PROJECT INFORMATION FORM Schedule 258 Large Power User Self-Directed Program (2010-2014), Competitive Phase

	PR	EPARER INFORMATION
	Co	mpany Name_ Mc KINSTRY
	Pri	mary Contact Person MATT MONTAGUER Title PROGRAM MANAGER
	Tel	ephone 206 832-8471 Fax 206 762-2624 E-Mail MTM@ McKINSTRY.CO
	Ma	illing Address Po Box 24567 City/State SEATLE / LA Zip: 96124
۱.	PR	OJECT LOCATION
	Fac	cility Name WA STATE GOVERNOR'S RESIDENCE PSE Acct. # 929-114-000-3
		E Service Address CAPITOL SUBSUTION-700 City: OLYMPIA Zip: 96501
II.	PR	OJECT INFORMATION
	1.	Equipment or System (space heating, lighting, process heating, refrigeration, motors, etc.)
		INTERIOR LIGHTING
	2.	Current System Electricity Use
		1) Estimate annual system baseline consumption (kWh/yr) 24, 340 kWh/YR
		2) Operating (hrs/yr) 2045 HRS/YR
		3) Peak demand (kW) 12
		4) Other relevant information (describe; attach as necessary)
		10/4/0
	3.	Est. Start Date 10/14/13
		7.00
	4.	Internal Project Mgr Phone 360) 902 - 7281
	5.	Project Designer or Vendor MAT MONTAGUER Phone 206) 832-8471
		Firm McKILSTRY
	7	Address 5005 - 320 AVE S City/State SEATLE / VA Zip 98134
	6.	Equipment Specifications (attach as needed)
		INFORMATION ATTACHED
	7.	Projected Life of Equipment or System (years) 12 YEARS



IV. EXPECTED RESULTS

1.	Estimated Project Costs (\$ amounts, with description)
	\$ 19,465 : TOTAL PROJECT COST, INCLUDING WSST
2.	Estimated Energy Savings Attach calculations or simulations based on standard engineering practices
	1) Annual electrical energy savings (kWh/yr) 17,985 kWt/YR
	NOTE: Lighting retrofit projects saving ≥ 300,000 kWh/yr require additional documentation. See RFP Section 5.1.
	2) Peak demand reduction (kW) 8.5 kW
3.	Non-Energy Benefits
	1) Describe benefits and quantify \$ savings \$634 - MTERAL COST SAVINGS DE TO
	LONGER LAND LIKE
	2) Check applicable non-quantified benefits:
	☑ Productivity increase ☑ Reduced maintenance ☑ Improved comfort ☐ Reduced noise
	☐ Convenience ☐ Other(describe)
4.	Estimated Funding
	Per cost-effectiveness criteria and funding formula published with RFP
	\$ 8,993
5.	Post–Installation Energy Savings Verification Plan With commitment to provide necessary documentation to PSE. Attach necessary details.
	Summary: 1) PERFORM LIGHT LEVEL SURVEY IN A STATLE OF ROOMS. 2) VERIFY A SAMPLE OF THE INSTALLED FIXTURES ARE PER SPECS.
	-) VECTES A SPACE OF THE INSTALLED FIXTURES ARE HER SPECS.
	oposals must be received by no later than 5:00 PM Pacific Daylight Savings Time esday, <u>July 16, 2013</u> .
Proposa	Is may be submitted via To submit by fax or e-mail,
	il to the following address: contact:
	Sound Energy Gus Takala
	Tel 425-462-3656 x 90868 EST-10W Fax 425-456-2455 ATTN: Gus Takala
	e, WA 98009-0868 E-mail: gus.takala@pse.com
ATTN: I	Katherine Sander
Applicat	tion submitted by (please print name) Thomas R. Henderson
Title_/	1851stant Director Facilities
Signatu	re Ihman (Studen Date 7/15/13
Receive	ed by PSE representative (print name)
	re Date
PSE Sch	258 Large Power User Self-Directed Program (2010-2014) Issued May 15, 2013 live Phase RFP Project Information Form

PSE Schedule 258 Grant Application

1) PROJECT DESCRIPTION

The WA State Governor's Residence, located on East Capitol Campus, was built in 1908. It has four occupied floors. The total building area is 21,400 square feet. The building envelope consists of concrete walls and single-pane windows with wood frame. Heating and cooling loads are served by campus steam and chilled water, respectively. The air distribution system includes fan coil units serving the occupied areas.

Occupancy is primarily residential. The basement level is primarily staff on facilities. The main floor is common areas; Dining Room, Kitchen, Ballroom, Parlor, and Sitting Room. The second floor is the personal residence space for the Governor's family. The fourth floor serves as guest rooms.

Electricity is supplied by Puget Sound Energy from the central Campus power sub-station, located near the southeast corner of the East Capitol Campus. The building electrical consumption and demand is submetered.

LIGHTING DESCRIPTION

The intent of this measure is to replace all incandescent lamps with LED equivalent lamps and upgrade old linear fluorescent fixtures.

Existing: The existing fixtures use traditional incandescent lamps in a variety of fixture types. These lamps consume higher energy, are inefficient at converting energy into light, and have a lower life expectancy than modern lamp technologies. Additionally, there are several fixtures with older technology linear fluorescent lamps which consume more energy than newer types.

Proposed: Replace each incandescent lamp with an LED equivalent and maintain the existing fixture. Lighting controls will remain. The T12 linear fluorescent fixtures shall be retrofitted to T8 lamps and electronic ballasts. Replace T12 under-cabinet lighting in the 2nd Floor Kitchen with LED replacements. All existing compact fluorescent 2 and 4-pin connection types will remain.

Benefits: LED lighting provides improved efficacy, efficiency, and operational life compared to traditional incandescent lamp types. New, lower wattage T8 linear fluorescent fixtures will produce improved light quality compared to the existing T12, while saving energy.



CLIENT NAME: WA DEPARTMENT OF ENTERPRISE SERVICES
JOB/PROJECT NAME: PSE SCHEDULE 258 GRANT / WA GOVERNOR'S RESIDENCE

DATE: 16 JULY 2013

PSE Schedule 258 Grant Application

2) DOCUMENTATION OF ENERGY USE BASELINE (kWh/yr)



CLIENT NAME: WA DEPARTMENT OF ENTERPRISE SERVICES

JOB/PROJECT NAME: PSE SCHEDULE 258 GRANT / WA GOVERNOR'S RESIDENCE
DATE: 16 JULY 2013



				Existing Proposed							Energy							
		Floor/General		# of	Watts per	Operating			# of	Watts		Operating	Existing	Proposed		Proposed	kW Savings	kWh Savings per
ID	Building Name 09.01-GOV Interior	Area	Room Name	Fixtures		Hours	Fixture Code	Description			# of Lamps			kW	Existing kWh			Year
1	Lighting Upgrade	1	Foyer 100	2	50	3650	LED-PAR38 18W	LED PAR38 screw-in lamp 18W	2	20	2	3650	0.1	0.0	329	131	0.05	197
2	09.01-GOV Interior Lighting Upgrade	1	Foyer 100	1	45	3650	LED-Candelabra 5W	LED Candelabra pointed tip screw-in lamp 5W	3	5	3	3650	0.0	0.0	148	49	0.03	99
	09.01-GOV Interior Lighting Upgrade	1	Coat Rm 102	1	180	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	3	10	3	730	0.2	0.0	118	20	0.14	99
	09.01-GOV Interior Lighting Upgrade		Entry Hall 103	3	45	3650	LED-Candelabra	LED Candelabra pointed tip screw-in lamp 5W	9		٥	3650	0.1	0.0	443	148		296
	09.01-GOV Interior						LED-Candelabra	LED Candelabra pointed tip screw-in			,							
	Lighting Upgrade 09.01-GOV Interior		Entry Hall 103	2			LED-Candelabra	lamp 5W LED Candelabra pointed tip screw-in	8		8	730	0.1			26		
7	Lighting Upgrade 09.01-GOV Interior	1	Ballroom 104	3	180	1460	5W LED-Candelabra	lamp 5W LED Candelabra pointed tip screw-in	36	5	36	1460	0.5	0.2	710	237	0.32	473
8	Lighting Upgrade 09.01-GOV Interior	1	Ballroom 104	8	60	1460	5W	lamp 5W	32	5	32	1460	0.4	0.1	631	210	0.29	420
9	Lighting Upgrade	1	Dinning Rm 105	8	35	1460	LED-MR16 10W	LED MR16 2-pin lamp 10W	8	10	8	1460	0.3	0.1	368	105	0.18	263
10	09.01-GOV Interior Lighting Upgrade	1	Dinning Rm 105	1	75	1460	LED-Candelabra 5W	LED Candelabra pointed tip screw-in lamp 5W	5	5	5	1460	0.1	0.0	99	33	0.05	66
	09.01-GOV Interior Lighting Upgrade	1	Sun Rm 107	1	160	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	1460	0.1	0.0	210	13	0.14	197
	09.01-GOV Interior Lighting Upgrade		Sun Rm 107	6	40		LED-PAR20 11W	LED PAR20 screw-in lamp 11W	6	10	6	1460	0.2		315	79		237
	09.01-GOV Interior		Sun Rm 107	-	50		LED-PAR20 11W	LED PAR20 screw-in lamp 11W	-	10		1460	0.2		131	26		105
	Lighting Upgrade 09.01-GOV Interior			2				·										
	Lighting Upgrade 09.01-GOV Interior	1	Sun Rm 107	2	75		LED-PAR38 18W	LED PAR38 screw-in lamp 18W	2	20	2	1460	0.1	0.0	197	53		145
	Lighting Upgrade 09.01-GOV Interior	1	Breeze Way 108	2	35	1460	LED-MR16 10W	LED MR16 2-pin lamp 10W	2	10	2	1460	0.1	0.0	92	26	0.05	66
16	Lighting Upgrade	1	Breeze Way 108	1	40	1460	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	1	10	1	1460	0.0	0.0	53	13	0.03	39
17	Lighting Upgrade	1	Entry 109	2	60	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	2	10	2	1460	0.1	0.0	158	26	0.09	131
18	09.01-GOV Interior Lighting Upgrade	1	RR 111	3	16	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	3	10	3	1460	0.0	0.0	63	39	0.02	24
	09.01-GOV Interior Lighting Upgrade	1	RR 111	1	60	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	1460	0.1	0.0	79	13	0.05	66
	09.01-GOV Interior Lighting Upgrade	1	Office 110	1	60	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	1460	0.1	0.0	79	13	0.05	66
	09.01-GOV Interior Lighting Upgrade		Hall 110A	1	60		LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	3650	0.1			33		
	09.01-GOV Interior							Lamp & Ballast retrofit, (2) 28W T8 &										
22	Lighting Upgrade	1	Kitchen 106	10	63	1460	EB2LN/28	normal ballast factor electronic ballast.	10	42	20	1460	0.6	0.4	828	552	0.19	276
	09.01-GOV Interior																	
	Lighting Upgrade 09.01-GOV Interior	1	Hallway 112	11	75	3650	LED-PAR38 18W	LED PAR38 screw-in lamp 18W	11	. 20	11	3650	0.7	0.2	2,710	723	0.54	1,987
	Lighting Upgrade	1	Hallway 112	6	40	3650	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	6	10	6	3650	0.2	0.1	788	197	0.16	591
	09.01-GOV Interior																	
	Lighting Upgrade 09.01-GOV Interior		Porior 113	20			LED-ALAMP 10W	LED A19 screw-in lamp 10W	20		20	1460	0.7		1,051	263		788
26	Lighting Upgrade 09.01-GOV Interior	1	Hallway	1	35	3650	LED-MR16 10W	LED MR16 2-pin lamp 10W	1	10	1	3650	0.0	0.0	115	33	0.02	82
27	Lighting Upgrade	1	Hallway	6	35	3650	LED-MR16 10W LED-Candelabra	LED MR16 2-pin lamp 10W LED Candelabra pointed tip screw-in	6	10	6	3650	0.2	0.1	690	197	0.14	493
28	Lighting Upgrade 09.01-GOV Interior	1	Women's 118	1	45	1460		lamp 5W	3	5	3	1460	0.0	0.0	59	20	0.03	39
29	Lighting Upgrade	1	Women's 118	2	40	1460	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	2	10	2	1460	0.1	0.0	105	26	0.05	79
30	09.01-GOV Interior Lighting Upgrade	1	Women's 118	2	50	1460	LED-PAR38 18W	LED PAR38 screw-in lamp 18W	2	20	2	1460	0.1	0.0	131	53	0.05	79
	09.01-GOV Interior Lighting Upgrade	1	Women's 118	1	60	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	1460	0.1	0.0	79	13	0.05	66
	09.01-GOV Interior Lighting Upgrade	1	Closet	1	60		LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	_ 1	1460	0.1	0.0	79	13		66
	09.01-GOV Interior Lighting Upgrade		Stair Hall 116	2	60		LED-ALAMP 10W	LED A19 screw-in lamp 10W	2		2	2920	0.1	0.0	315	53		263
	09.01-GOV Interior Lighting Upgrade		Sitting Rm 115	1	90		LED-Candelabra	LED Candelabra pointed tip screw-in lamp 5W	6		- 6	1460	0.1			39		
	09.01-GOV Interior Lighting Upgrade		Sitting Rm 115	1	35		LED-MR16 10W	LED MR16 2-pin lamp 10W	1		1	1460	0.0	0.0	46	13		33
	09.01-GOV Interior		<u> </u>		-		LED-Candelabra	LED Candelabra pointed tip screw-in	_		1							
	Lighting Upgrade 09.01-GOV Interior	1	Library 114	1	120			lamp 5W	8		8	1460	0.1			53		105
	Lighting Upgrade 09.01-GOV Interior		R1	1	35		LED-MR16 10W	LED MR16 2-pin lamp 10W	1	10	1	1460	0.0	0.0	46	13	0.02	33
38	Lighting Upgrade		R1	3	40	1460	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	3	10	3	1460	0.1	0.0	158	39	0.08	118



				Existing Proposed								Energy							
					LAISTING			Рторозе								cigy			
ID	Building Name 09.01-GOV Interior	Floor/General Area	Room Name	# of Fixtures	Watts per Fixture		Fixture Code	Description	# of Fixtures	Watts per Fixture	# of Lamps		Existing kW	Proposed kW	Existing kWh	Proposed kWh		kWh Savings per Year	
39	Lighting Upgrade	3	Bedroom 306	1	60	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	1460	0.1	0.0	79	13	0.05	66	
	09.01-GOV Interior Lighting Upgrade	3	Closet	1	60	365	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	365	0.1	0.0	20	3	0.05	16	
	09.01-GOV Interior Lighting Upgrade	-	Office 308	1	60	1825	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	1825	0.1	0.0	99	16	0.05	82	
	09.01-GOV Interior			1					1							10			
42	Lighting Upgrade	3	Closet 307	1	60	365	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	365	0.1	0.0	20	3	0.05	16	
43	09.01-GOV Interior Lighting Upgrade 09.01-GOV Interior	3	Storage 309	1	19	8760	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	8760	0.0	0.0	150	79	0.01	71	
44	Lighting Upgrade	2	Kitchen 208	2	100	8760	LED-ALAMP 10W	LED A19 screw-in lamp 10W	2	10	2	8760	0.2	0.0	1,577	158	0.16	1,419	
	09.01-GOV Interior Lighting Upgrade	2	2 RR 207	1	180	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	3	10	3	1460	0.2	0.0	237	39	0.14	197	
49	09.01-GOV Interior Lighting Upgrade	2	Patio	2	19	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	2	10	2	730	0.0	0.0	25	13	0.02	12	
50	09.01-GOV Interior Lighting Upgrade	2	Family Rm 205	2	35	1825	LED-MR16 10W	LED MR16 2-pin lamp 10W	2	10	2	1825	0.1	0.0	115	33	0.05	82	
	09.01-GOV Interior Lighting Upgrade	2	2 Hall 201	3	35	3650	LED-MR16 10W	LED MR16 2-pin lamp 10W	3	10	3	3650	0.1	0.0	345	99	0.07	246	
	09.01-GOV Interior Lighting Upgrade		2 Hall 201	0	35		LED-MR16 10W	LED MR16 2-pin lamp 10W	9	10	9	3650	0.3	0.1	1,035	296			
	09.01-GOV Interior			,					,		, , , ,								
	Lighting Upgrade 09.01-GOV Interior		Master Bed 202	1	35		LED-MR16 10W	LED MR16 2-pin lamp 10W	1	10	1	1460	0.0	0.0		13			
59	Lighting Upgrade 09.01-GOV Interior	2	Bathroom 204	4	60	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	4	10	4	730	0.2	0.0	158	26	0.18	131	
60	Lighting Upgrade 09.01-GOV Interior	2	Shower 204B	1	60	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	730	0.1	0.0	39	7	0.05	33	
	Lighting Upgrade	2	Toilet 204C	1	30	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	730	0.0	0.0	20	7	0.02	13	
64	09.01-GOV Interior Lighting Upgrade 09.01-GOV Interior	2	Hall 218	1	120	3650	LED-ALAMP 10W LED-Candelabra	LED A19 screw-in lamp 10W LED Candelabra pointed tip screw-in	2	10	2	3650	0.1	0.0	394	66	0.09	329	
65	Lighting Upgrade	2	Bedroom 219	1	75	1460	5W	lamp 5W	5	5	5	1460	0.1	0.0	99	33	0.05	66	
	09.01-GOV Interior Lighting Upgrade	2	Bedroom 219	2	30	1460	LED-Candelabra 5W	LED Candelabra pointed tip screw-in lamp 5W	4	5	4	1460	0.1	0.0	79	26	0.04	53	
67	09.01-GOV Interior Lighting Upgrade 09.01-GOV Interior	2	Closet	1	60	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	730	0.1	0.0	39	7	0.05	33	
68	Lighting Upgrade	2	Bedroom 217	1	120	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	2	10	2	1460	0.1	0.0	158	26	0.09	131	
69	09.01-GOV Interior Lighting Upgrade	2	Closet	1	60	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	730	0.1	0.0	39	7	0.05	33	
	09.01-GOV Interior Lighting Upgrade	2	Bedroom 216	1	120	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	2	10	2	1460	0.1	0.0	158	26	0.09	131	
	09.01-GOV Interior Lighting Upgrade		2 Closet	1	60		LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	730	0.1	0.0	39	7			
	09.01-GOV Interior Lighting Upgrade		2 Bathroom 220	1	43		EB1LN	Lamp & Ballast retrofit, (1) 32W T8 & normal ballast factor electronic ballast.	1	28	1	1460	0.0	0.0		37		20	
	09.01-GOV Interior Lighting Upgrade	,	Bedroom 215	3	40	1460	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	3	10	3	1460	0.1	0.0	158	39	0.08	118	
75	09.01-GOV Interior Lighting Upgrade		2 Bathroom 214	1	43		EB1LN	Lamp & Ballast retrofit, (1) 32W T8 & normal ballast factor electronic ballast.	1	28	1	1460	0.0	0.0	57	37		20	
	09.01-GOV Interior Lighting Upgrade	2	Bathroom 214	1	40	1460	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	1	10	1	1460	0.0	0.0	53	13	0.03	39	
	09.01-GOV Interior Lighting Upgrade		2 Bathroom 213	1	43		EB1LN	Lamp & Ballast retrofit, (1) 32W T8 & normal ballast factor electronic ballast.	1	28	1	1460	0.0	0.0	57	37		20	
	09.01-GOV Interior																		
	Lighting Upgrade 09.01-GOV Interior		Bathroom 213	1	40		LED-PAR20 11W	LED PAR20 screw-in lamp 11W	1	10	1	1460	0.0	0.0		13		39	
	Lighting Upgrade 09.01-GOV Interior	2	Bedroom 212	3	40	1460	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	3	10	3	1460	0.1	0.0	158	39	0.08	118	
80	Lighting Upgrade 09.01-GOV Interior	2	2 Hall 211	6	40	3650	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	6	10	6	3650	0.2	0.1	788	197	0.16	591	
81	Lighting Upgrade	2	Hall 211	2	40	3650	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	2	10	2	3650	0.1	0.0	263	66	0.05	197	
82	09.01-GOV Interior Lighting Upgrade	2	2 Hall 200	6	40	3650	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	6	10	6	3650	0.2	0.1	788	197	0.16	591	
83	09.01-GOV Interior Lighting Upgrade 09.01-GOV Interior	2	Hall 200	2	35	3650	LED-MR16 10W	LED MR16 2-pin lamp 10W	2	10	2	3650	0.1	0.0	230	66	0.05	164	
	Lighting Upgrade	2	Balcony	1	180	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	3	10	3	730	0.2	0.0	118	20	0.14	99	



				Existing Proposed									Energy								
		Floor/General		# of	Watts per	Operating			# of	Watts		Operating	Evisting	Proposed		Proposed	kW Savings	kWh Savings per			
ID	Building Name 09.01-GOV Interior	Area	Room Name				Fixture Code	Description	Fixtures		# of Lamps			kW	Existing kWh			Year			
85	Lighting Upgrade	2	Hall Stair	1	35	3650	LED-MR16 10W	LED MR16 2-pin lamp 10W	1	10	1	3650	0.0	0.0	115	33	0.02	82			
	09.01-GOV Interior Lighting Upgrade	3	Family Rm 300	3	180	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	3	10	3	1460	0.5	0.0	710	39	0.46	670			
	09.01-GOV Interior Lighting Upgrade	3	Bathroom 303	1	120	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	2	10	2	1460	0.1	0.0	158	26	0.09	131			
	09.01-GOV Interior Lighting Upgrade	3	Bedroom 302	1	60	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	1460	0.1	0.0	79	13	0.05	66			
	09.01-GOV Interior Lighting Upgrade		Closet	1	60		LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	730	0.1				0.05				
	09.01-GOV Interior		Attic 301	,	60		LED-ALAMP 10W	LED A19 screw-in lamp 10W	3			730	0.2	0.0	118						
	Lighting Upgrade 09.01-GOV Interior			3					3		3										
	Lighting Upgrade 09.01-GOV Interior		3rd Stair Hall	1	60		LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	2920	0.1	0.0							
	Lighting Upgrade 09.01-GOV Interior		2nd Stair Hall	2	60		LED-ALAMP 10W	LED A19 screw-in lamp 10W	2		2	2920	0.1	0.0	315						
	Lighting Upgrade 09.01-GOV Interior	1	Stairs	3	60	2920	LED-ALAMP 10W	LED A19 screw-in lamp 10W	3	10	3	2920	0.2	0.0	473	79	0.14	394			
	Lighting Upgrade 09.01-GOV Interior	Е	Conf Rm 014	3	120	1825	LED-ALAMP 10W	LED A19 screw-in lamp 10W	6	10	6	1825	0.3	0.1	591	99	0.27	493			
96	Lighting Upgrade 09.01-GOV Interior	E	Safe	1	60	365	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	365	0.1	0.0	20	3	0.05	16			
97	Lighting Upgrade	E	Conf Rm Bar	2	40	1825	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	2	10	2	1825	0.1	0.0	131	33	0.05	99			
	09.01-GOV Interior Lighting Upgrade	E	Hallway 013	1	60	3650	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	3650	0.1	0.0	197	33	0.05	164			
99	09.01-GOV Interior Lighting Upgrade	E	Hallway 013	1	79	3650	IND4-2	4'-0" Industrial with white reflector, (2) 32W T8 and EB2L electronic ballast.	1	. 55	2	3650	0.1	0.0	260	181	0.02	79			
100	09.01-GOV Interior Lighting Upgrade	E	Storage 018	2	60	365	LED-ALAMP 10W	LED A19 screw-in lamp 10W	2	10	2	365	0.1	0.0	39	7	0.09	33			
101	09.01-GOV Interior Lighting Upgrade	E	RR 017	1	150	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	1460	0.1	0.0	197	13	0.13	184			
	09.01-GOV Interior Lighting Upgrade	E	Hallway 013	1	60	3650	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	3650	0.1	0.0	197	33	0.05	164			
	09.01-GOV Interior Lighting Upgrade	E	Hallway 010	1	60	3650	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	3650	0.1	0.0	197	33	0.05	164			
	09.01-GOV Interior Lighting Upgrade	F	Hallway 010	1	60	3650	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	3650	0.1	0.0	197	33	0.05	164			
	09.01-GOV Interior Lighting Upgrade		Storage 019	1	60		LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	730	0.1	0.0	39	7	0.05				
	09.01-GOV Interior Lighting Upgrade		Laundry 009	3	63		EB2LN/28	Lamp & Ballast retrofit, (2) 28W T8 & normal ballast factor electronic ballast.	3	42	6	1825		0.1	310	207					
Tot al				223					331		345		12	3	24,261	6,332	8	17,929			
								1			343				,	0,002					

CONFIDENTIAL AND PROPRIETARY 7/15/2013

PSE Schedule 258 Grant Application

3) CALCULATED ENERGY SAVINGS (kWh/yr) AND PEAK DEMAND (kW) REDUCTION



CLIENT NAME: WA DEPARTMENT OF ENTERPRISE SERVICES
JOB/PROJECT NAME: PSE SCHEDULE 258 GRANT / WA GOVERNOR'S RESIDENCE

DATE: 16 JULY 2013



				Existing Proposed							Energy							
		Floor/General		# of	Watts per	Operating			# of	Watts		Operating	Existing	Proposed		Proposed	kW Savings	kWh Savings per
ID	Building Name 09.01-GOV Interior	Area	Room Name	Fixtures		Hours	Fixture Code	Description			# of Lamps			kW	Existing kWh			Year
1	Lighting Upgrade	1	Foyer 100	2	50	3650	LED-PAR38 18W	LED PAR38 screw-in lamp 18W	2	20	2	3650	0.1	0.0	329	131	0.05	197
2	09.01-GOV Interior Lighting Upgrade	1	Foyer 100	1	45	3650	LED-Candelabra 5W	LED Candelabra pointed tip screw-in lamp 5W	3	5	3	3650	0.0	0.0	148	49	0.03	99
	09.01-GOV Interior Lighting Upgrade	1	Coat Rm 102	1	180	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	3	10	3	730	0.2	0.0	118	20	0.14	99
	09.01-GOV Interior Lighting Upgrade		Entry Hall 103	3	45	3650	LED-Candelabra	LED Candelabra pointed tip screw-in lamp 5W	9		٥	3650	0.1	0.0	443	148		296
	09.01-GOV Interior						LED-Candelabra	LED Candelabra pointed tip screw-in			,							
	Lighting Upgrade 09.01-GOV Interior		Entry Hall 103	2			LED-Candelabra	lamp 5W LED Candelabra pointed tip screw-in	8		8	730	0.1			26		
7	Lighting Upgrade 09.01-GOV Interior	1	Ballroom 104	3	180	1460	5W LED-Candelabra	lamp 5W LED Candelabra pointed tip screw-in	36	5	36	1460	0.5	0.2	710	237	0.32	473
8	Lighting Upgrade 09.01-GOV Interior	1	Ballroom 104	8	60	1460	5W	lamp 5W	32	5	32	1460	0.4	0.1	631	210	0.29	420
9	Lighting Upgrade	1	Dinning Rm 105	8	35	1460	LED-MR16 10W	LED MR16 2-pin lamp 10W	8	10	8	1460	0.3	0.1	368	105	0.18	263
10	09.01-GOV Interior Lighting Upgrade	1	Dinning Rm 105	1	75	1460	LED-Candelabra 5W	LED Candelabra pointed tip screw-in lamp 5W	5	5	5	1460	0.1	0.0	99	33	0.05	66
	09.01-GOV Interior Lighting Upgrade	1	Sun Rm 107	1	160	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	1460	0.1	0.0	210	13	0.14	197
	09.01-GOV Interior Lighting Upgrade		Sun Rm 107	6	40		LED-PAR20 11W	LED PAR20 screw-in lamp 11W	6	10	6	1460	0.2		315	79		237
	09.01-GOV Interior		Sun Rm 107	-	50		LED-PAR20 11W	LED PAR20 screw-in lamp 11W	2	10		1460	0.2		131	26		105
	Lighting Upgrade 09.01-GOV Interior			2				·										
	Lighting Upgrade 09.01-GOV Interior	1	Sun Rm 107	2	75		LED-PAR38 18W	LED PAR38 screw-in lamp 18W	2	20	2	1460	0.1	0.0	197	53		145
	Lighting Upgrade 09.01-GOV Interior	1	Breeze Way 108	2	35	1460	LED-MR16 10W	LED MR16 2-pin lamp 10W	2	10	2	1460	0.1	0.0	92	26	0.05	66
16	Lighting Upgrade	1	Breeze Way 108	1	40	1460	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	1	10	1	1460	0.0	0.0	53	13	0.03	39
17	Lighting Upgrade	1	Entry 109	2	60	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	2	10	2	1460	0.1	0.0	158	26	0.09	131
18	09.01-GOV Interior Lighting Upgrade	1	RR 111	3	16	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	3	10	3	1460	0.0	0.0	63	39	0.02	24
	09.01-GOV Interior Lighting Upgrade	1	RR 111	1	60	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	1460	0.1	0.0	79	13	0.05	66
	09.01-GOV Interior Lighting Upgrade	1	Office 110	1	60	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	1460	0.1	0.0	79	13	0.05	66
	09.01-GOV Interior Lighting Upgrade		Hall 110A	1	60		LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	3650	0.1			33		
	09.01-GOV Interior							Lamp & Ballast retrofit, (2) 28W T8 &										
22	Lighting Upgrade	1	Kitchen 106	10	63	1460	EB2LN/28	normal ballast factor electronic ballast.	10	42	20	1460	0.6	0.4	828	552	0.19	276
	09.01-GOV Interior																	
	Lighting Upgrade 09.01-GOV Interior	1	Hallway 112	11	75	3650	LED-PAR38 18W	LED PAR38 screw-in lamp 18W	11	. 20	11	3650	0.7	0.2	2,710	723	0.54	1,987
	Lighting Upgrade	1	Hallway 112	6	40	3650	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	6	10	6	3650	0.2	0.1	788	197	0.16	591
	09.01-GOV Interior																	
	Lighting Upgrade 09.01-GOV Interior		Porior 113	20			LED-ALAMP 10W	LED A19 screw-in lamp 10W	20		20	1460	0.7		1,051	263		788
26	Lighting Upgrade 09.01-GOV Interior	1	Hallway	1	35	3650	LED-MR16 10W	LED MR16 2-pin lamp 10W	1	10	1	3650	0.0	0.0	115	33	0.02	82
27	Lighting Upgrade	1	Hallway	6	35	3650	LED-MR16 10W LED-Candelabra	LED MR16 2-pin lamp 10W LED Candelabra pointed tip screw-in	6	10	6	3650	0.2	0.1	690	197	0.14	493
28	Lighting Upgrade 09.01-GOV Interior	1	Women's 118	1	45	1460		lamp 5W	3	5	3	1460	0.0	0.0	59	20	0.03	39
29	Lighting Upgrade	1	Women's 118	2	40	1460	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	2	10	2	1460	0.1	0.0	105	26	0.05	79
30	09.01-GOV Interior Lighting Upgrade	1	Women's 118	2	50	1460	LED-PAR38 18W	LED PAR38 screw-in lamp 18W	2	20	2	1460	0.1	0.0	131	53	0.05	79
	09.01-GOV Interior Lighting Upgrade	1	Women's 118	1	60	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	1460	0.1	0.0	79	13	0.05	66
	09.01-GOV Interior Lighting Upgrade	1	Closet	1	60		LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	_ 1	1460	0.1	0.0	79	13		66
	09.01-GOV Interior Lighting Upgrade		Stair Hall 116	2	60		LED-ALAMP 10W	LED A19 screw-in lamp 10W	2		2	2920	0.1	0.0	315	53		263
	09.01-GOV Interior Lighting Upgrade		Sitting Rm 115	1	90		LED-Candelabra	LED Candelabra pointed tip screw-in lamp 5W	6		- 6	1460	0.1			39		
	09.01-GOV Interior Lighting Upgrade		Sitting Rm 115	1	35		LED-MR16 10W	LED MR16 2-pin lamp 10W	1		1	1460	0.0	0.0	46	13		33
	09.01-GOV Interior		<u> </u>		-		LED-Candelabra	LED Candelabra pointed tip screw-in	_		1							
	Lighting Upgrade 09.01-GOV Interior	1	Library 114	1	120			lamp 5W	8		8	1460	0.1			53		105
	Lighting Upgrade 09.01-GOV Interior		R1	1	35		LED-MR16 10W	LED MR16 2-pin lamp 10W	1	10	1	1460	0.0	0.0	46	13	0.02	33
38	Lighting Upgrade		R1	3	40	1460	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	3	10	3	1460	0.1	0.0	158	39	0.08	118



					Existing		Proposed						Energy					
					LAISTING			Рторозе								cigy		
ID	Building Name 09.01-GOV Interior	Floor/General Area	Room Name	# of Fixtures	Watts per Fixture		Fixture Code	Description	# of Fixtures	Watts per Fixture	# of Lamps		Existing kW	Proposed kW	Existing kWh	Proposed kWh		kWh Savings per Year
39	Lighting Upgrade	3	Bedroom 306	1	60	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	1460	0.1	0.0	79	13	0.05	66
	09.01-GOV Interior Lighting Upgrade	3	Closet	1	60	365	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	365	0.1	0.0	20	3	0.05	16
	09.01-GOV Interior Lighting Upgrade	-	Office 308	1	60	1825	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	1825	0.1	0.0	99	16	0.05	82
	09.01-GOV Interior			1					1							10		
42	Lighting Upgrade	3	Closet 307	1	60	365	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	365	0.1	0.0	20	3	0.05	16
43	09.01-GOV Interior Lighting Upgrade 09.01-GOV Interior	3	Storage 309	1	19	8760	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	8760	0.0	0.0	150	79	0.01	71
44	Lighting Upgrade	2	Kitchen 208	2	100	8760	LED-ALAMP 10W	LED A19 screw-in lamp 10W	2	10	2	8760	0.2	0.0	1,577	158	0.16	1,419
	09.01-GOV Interior Lighting Upgrade	2	2 RR 207	1	180	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	3	10	3	1460	0.2	0.0	237	39	0.14	197
49	09.01-GOV Interior Lighting Upgrade	2	Patio	2	19	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	2	10	2	730	0.0	0.0	25	13	0.02	12
50	09.01-GOV Interior Lighting Upgrade	2	Family Rm 205	2	35	1825	LED-MR16 10W	LED MR16 2-pin lamp 10W	2	10	2	1825	0.1	0.0	115	33	0.05	82
	09.01-GOV Interior Lighting Upgrade	2	2 Hall 201	3	35	3650	LED-MR16 10W	LED MR16 2-pin lamp 10W	3	10	3	3650	0.1	0.0	345	99	0.07	246
	09.01-GOV Interior Lighting Upgrade		2 Hall 201	0	35		LED-MR16 10W	LED MR16 2-pin lamp 10W	9	10	9	3650	0.3	0.1	1,035	296		
	09.01-GOV Interior			,					,		, , , ,							
	Lighting Upgrade 09.01-GOV Interior		Master Bed 202	1	35		LED-MR16 10W	LED MR16 2-pin lamp 10W	1	10	1	1460	0.0	0.0		13		
59	Lighting Upgrade 09.01-GOV Interior	2	Bathroom 204	4	60	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	4	10	4	730	0.2	0.0	158	26	0.18	131
60	Lighting Upgrade 09.01-GOV Interior	2	Shower 204B	1	60	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	730	0.1	0.0	39	7	0.05	33
	Lighting Upgrade	2	Toilet 204C	1	30	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	730	0.0	0.0	20	7	0.02	13
64	09.01-GOV Interior Lighting Upgrade 09.01-GOV Interior	2	Hall 218	1	120	3650	LED-ALAMP 10W LED-Candelabra	LED A19 screw-in lamp 10W LED Candelabra pointed tip screw-in	2	10	2	3650	0.1	0.0	394	66	0.09	329
65	Lighting Upgrade	2	Bedroom 219	1	75	1460	5W	lamp 5W	5	5	5	1460	0.1	0.0	99	33	0.05	66
	09.01-GOV Interior Lighting Upgrade	2	Bedroom 219	2	30	1460	LED-Candelabra 5W	LED Candelabra pointed tip screw-in lamp 5W	4	5	4	1460	0.1	0.0	79	26	0.04	53
67	09.01-GOV Interior Lighting Upgrade 09.01-GOV Interior	2	Closet	1	60	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	730	0.1	0.0	39	7	0.05	33
68	Lighting Upgrade	2	Bedroom 217	1	120	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	2	10	2	1460	0.1	0.0	158	26	0.09	131
69	09.01-GOV Interior Lighting Upgrade	2	Closet	1	60	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	730	0.1	0.0	39	7	0.05	33
	09.01-GOV Interior Lighting Upgrade	2	Bedroom 216	1	120	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	2	10	2	1460	0.1	0.0	158	26	0.09	131
	09.01-GOV Interior Lighting Upgrade		2 Closet	1	60		LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	730	0.1	0.0	39	7		
	09.01-GOV Interior Lighting Upgrade		2 Bathroom 220	1	43		EB1LN	Lamp & Ballast retrofit, (1) 32W T8 & normal ballast factor electronic ballast.	1	28	1	1460	0.0	0.0		37		20
	09.01-GOV Interior Lighting Upgrade	,	Bedroom 215	3	40	1460	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	3	10	3	1460	0.1	0.0	158	39	0.08	118
75	09.01-GOV Interior Lighting Upgrade		2 Bathroom 214	1	43		EB1LN	Lamp & Ballast retrofit, (1) 32W T8 & normal ballast factor electronic ballast.	1	28	1	1460	0.0	0.0	57	37		20
	09.01-GOV Interior Lighting Upgrade	2	Bathroom 214	1	40	1460	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	1	10	1	1460	0.0	0.0	53	13	0.03	39
	09.01-GOV Interior Lighting Upgrade		2 Bathroom 213	1	43		EB1LN	Lamp & Ballast retrofit, (1) 32W T8 & normal ballast factor electronic ballast.	1	28	1	1460	0.0	0.0	57	37		20
	09.01-GOV Interior																	
	Lighting Upgrade 09.01-GOV Interior		Bathroom 213	1	40		LED-PAR20 11W	LED PAR20 screw-in lamp 11W	1	10	1	1460	0.0	0.0		13		39
	Lighting Upgrade 09.01-GOV Interior	2	Bedroom 212	3	40	1460	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	3	10	3	1460	0.1	0.0	158	39	0.08	118
80	Lighting Upgrade 09.01-GOV Interior	2	2 Hall 211	6	40	3650	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	6	10	6	3650	0.2	0.1	788	197	0.16	591
81	Lighting Upgrade	2	Hall 211	2	40	3650	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	2	10	2	3650	0.1	0.0	263	66	0.05	197
82	09.01-GOV Interior Lighting Upgrade	2	2 Hall 200	6	40	3650	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	6	10	6	3650	0.2	0.1	788	197	0.16	591
83	09.01-GOV Interior Lighting Upgrade 09.01-GOV Interior	2	Hall 200	2	35	3650	LED-MR16 10W	LED MR16 2-pin lamp 10W	2	10	2	3650	0.1	0.0	230	66	0.05	164
	Lighting Upgrade	2	Balcony	1	180	730	LED-ALAMP 10W	LED A19 screw-in lamp 10W	3	10	3	730	0.2	0.0	118	20	0.14	99



					Existing		Proposed							Energy					
		Floor/General		# of	Watts per	Operating			# of	Watts		Operating	Evisting	Proposed		Proposed	kW Savings	kWh Savings per	
ID	Building Name 09.01-GOV Interior	Area	Room Name				Fixture Code	Description	Fixtures		# of Lamps			kW	Existing kWh			Year	
85	Lighting Upgrade	2	Hall Stair	1	35	3650	LED-MR16 10W	LED MR16 2-pin lamp 10W	1	10	1	3650	0.0	0.0	115	33	0.02	82	
	09.01-GOV Interior Lighting Upgrade	3	Family Rm 300	3	180	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	3	10	3	1460	0.5	0.0	710	39	0.46	670	
	09.01-GOV Interior Lighting Upgrade	3	Bathroom 303	1	120	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	2	10	2	1460	0.1	0.0	158	26	0.09	131	
	09.01-GOV Interior Lighting Upgrade	3	Bedroom 302	1	60	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	1460	0.1	0.0	79	13	0.05	66	
	09.01-GOV Interior Lighting Upgrade		Closet	1	60		LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	730	0.1				0.05		
	09.01-GOV Interior		Attic 301	,	60		LED-ALAMP 10W	LED A19 screw-in lamp 10W	3			730	0.2	0.0	118				
	Lighting Upgrade 09.01-GOV Interior			3					3		3								
	Lighting Upgrade 09.01-GOV Interior		3rd Stair Hall	1	60		LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	2920	0.1	0.0					
	Lighting Upgrade 09.01-GOV Interior		2nd Stair Hall	2	60		LED-ALAMP 10W	LED A19 screw-in lamp 10W	2		2	2920	0.1	0.0	315				
	Lighting Upgrade 09.01-GOV Interior	1	Stairs	3	60	2920	LED-ALAMP 10W	LED A19 screw-in lamp 10W	3	10	3	2920	0.2	0.0	473	79	0.14	394	
	Lighting Upgrade 09.01-GOV Interior	Е	Conf Rm 014	3	120	1825	LED-ALAMP 10W	LED A19 screw-in lamp 10W	6	10	6	1825	0.3	0.1	591	99	0.27	493	
96	Lighting Upgrade 09.01-GOV Interior	E	Safe	1	60	365	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	365	0.1	0.0	20	3	0.05	16	
97	Lighting Upgrade	E	Conf Rm Bar	2	40	1825	LED-PAR20 11W	LED PAR20 screw-in lamp 11W	2	10	2	1825	0.1	0.0	131	33	0.05	99	
	09.01-GOV Interior Lighting Upgrade	E	Hallway 013	1	60	3650	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	3650	0.1	0.0	197	33	0.05	164	
99	09.01-GOV Interior Lighting Upgrade	E	Hallway 013	1	79	3650	IND4-2	4'-0" Industrial with white reflector, (2) 32W T8 and EB2L electronic ballast.	1	. 55	2	3650	0.1	0.0	260	181	0.02	79	
100	09.01-GOV Interior Lighting Upgrade	E	Storage 018	2	60	365	LED-ALAMP 10W	LED A19 screw-in lamp 10W	2	10	2	365	0.1	0.0	39	7	0.09	33	
101	09.01-GOV Interior Lighting Upgrade	E	RR 017	1	150	1460	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	1460	0.1	0.0	197	13	0.13	184	
	09.01-GOV Interior Lighting Upgrade	E	Hallway 013	1	60	3650	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	3650	0.1	0.0	197	33	0.05	164	
	09.01-GOV Interior Lighting Upgrade	E	Hallway 010	1	60	3650	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	3650	0.1	0.0	197	33	0.05	164	
	09.01-GOV Interior Lighting Upgrade	F	Hallway 010	1	60	3650	LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	3650	0.1	0.0	197	33	0.05	164	
	09.01-GOV Interior Lighting Upgrade		Storage 019	1	60		LED-ALAMP 10W	LED A19 screw-in lamp 10W	1	10	1	730	0.1	0.0	39	7	0.05		
	09.01-GOV Interior Lighting Upgrade		Laundry 009	3	63		EB2LN/28	Lamp & Ballast retrofit, (2) 28W T8 & normal ballast factor electronic ballast.	3	42	6	1825		0.1	310	207			
Tot al				223					331		345		12	3	24,261	6,332	8	17,929	
								1			343				,	0,002			

CONFIDENTIAL AND PROPRIETARY 7/15/2013

PSE Schedule 258 Grant Application

4) MEASURE COST DOCUMENTATION



CLIENT NAME: WA DEPARTMENT OF ENTERPRISE SERVICES
JOB/PROJECT NAME: PSE SCHEDULE 258 GRANT / WA GOVERNOR'S RESIDENCE

DATE: 16 JULY 2013

FIM: Interior Lighting Upgrades Date: 7/11/13
Building: WA State Governor's Residence WA State Governor's Residence
Project: Ph 2 By: MMM

Qty	Item	Unit Cost	Cost
1	Interior Lighting Electrical Labor and Material Installation Cost	\$17,907	\$17,907
-			
i			
	IOUDTOTAL	-	\$17,907
	SUBTOTAL		\$17,907
	TAX Total Construction Cost		\$1,558 \$19,465

TOSHIBA

Leading Innovation >>>

Project:	Toshiba Lamp:
Type:	Notes:

A19

rmation	Ordering Code	Input Voltage (VAC)	Lamp Shape	Base Type	CCT ¹	Initial Lumens (Im) ²	Wattage (W)	Lamp Efficacy (Im/W)	Rated Life (hrs) ³	CRI	Power Factor	Equivalency⁴	Lamp Weight Ib(g)	Dimmable	energy Star
g Info	8A19/27F-UP	120	A19	E26	2700K	450	8.4	53.6	25,000	81	> 0.74	40W Incandescent	0.4 (180)	Yes	•
derin	8A19/27FZ-UP	120	A19	E26	2700K	450	7.7	58.4	25,000	81	> 0.74	40W Incandescent	0.4 (180)	No	•
Ord	8A19/40F-UP	120	A19	E26	4000K	500	8.4	59.5	25,000	82	> 0.74	40W Incandescent	0.4 (180)	Yes	•
	8A19/40FZ-UP	120	A19	E26	4000K	500	7.7	64.9	25,000	82	> 0.74	40W Incandescent	0.4 (180)	No	•

- 1. CCT Range complies to ANSI C78.377-2008.
- 2. Thermally stable typical lumens ($\pm 10\%$)
- 3. Rated life is based on 70% lumen maintenance and engineering testing and probability analysis; life hours per ENERGY STAR® may vary.
- 4. Equivalency based on the ENERGY STAR® Integral LED Lamp criteria for omnidirectional lamps.

Note: All information consistent with IESNALM-80-08 results and IESNALM-79-08 testing completed by a qualified third party facility. All lamps meet ENERGY STAR Integral LED Lamp requirements and will be submitted for testing. Five-year warranty based on 12 hr/day usage. Toshiba LED Lighting Systems Division reserves the right to make changes and/or improvements in designs and/or dimensions without notice or obligation.



Model A19

MOL (A) 4.35" (110.5 mm)

Diameter (B) 2.35" (59.7 mm)

Note: Lamp shape conforms to ANSI C78.21-2003. Designed to comply with RoHS Directive 2002/95/EC.

 Ordering Code	40W Halogen
 8A19/27F-UP	\$86.90
8A19/40F-UP	\$86.90
8A19/27FZ-UP	\$88.83
8A19/40FZ-UP	\$88.83

Note: Energy savings based on using one bulb for 25,000 hr rated life at 11¢/kWh. Does not include maintenance and replacement lamp savings.

Product Description

Designed from the ground up as a totally optimized LED street light system, the XSP Series delivers incredible efficiency and is designed to provide L70 lifetime over 100,000 hours without sacrificing application performance. Beyond substantial energy savings and reduced maintenance, Cree achieves better optical control with our NanoOptic* Precision Delivery Grid™ optic than a traditional cobra head luminaire. The Cree XSP Series LED Street Light is the best alternative for traditional street lighting with better payback and better performance.

Performance Summary

Utilizes BetaLED® Technology

NanoOptic Precision Delivery Grid optic

CRI: Minimum 70 CRI

CCT: 4000K (+/- 300K), 5700K (+/- 500K)

Warranty: 10 years on luminaire/limited 10 years on Colorfast DeltaGuard® finish

Made in the U.S.A. of U.S. and imported parts

Accessories

Field Installed Accessories

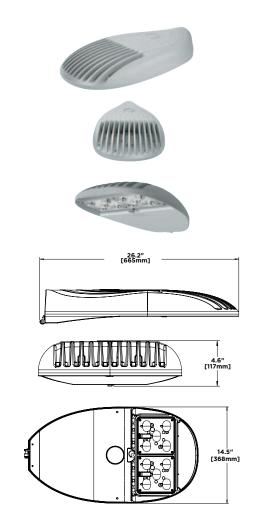
XA-SP2BLS

Backlight Control Shield

- Provides 1/2 Mounting Height Cutoff

XA-SP2BRDSPK

Bird Spikes



Ordering Information

Example: BXSPA032A-USF

BXSP	Α	0			Α	-			
Product	Version	Mounting	Optic	Modules	Input Power	_	Voltage	Color Options	Options
BXSP	A	O Horizontal Tenon	3 Type III H Type III w/ BLS	2 Standard 4000K B Standard 5700K H High Efficacy 4000K* P High Efficacy 5700K*	A 101W	-	U Universal 120-277V V Universal 347- 480V**	S Silver (Standard) T Black Z Bronze B Platinum Bronze W White	A ROAM* Controls Installation of ROAM dimming control module only. Services provided by others. Includes R option F Fuse When code dictates fusing, use time delay fuse Not available with V voltage K Occupancy Control Refer to Occupancy Control spec sheet for details N Utility Label and NEMA Photocell Receptacle Includes Q option Refer to Field Adjustble Output spec sheet for details G Field Adjustable Output Refer to Field Adjustable Output spec sheet for details R NEMA Photocell Receptacle Photocell by others U Utility Includes exterior wattage label that indicates the maximum available wattage of the luminaire Includes Q option Refer to Field Adjustable Output spec sheet for details

^{*} Available Q3 2012. Preliminary data shown.

^{** 347-480}V, refer to the Lumen Output, Electrical, and Lumen Maintenance data table below.







Rev. Date: 9/14/2012



Product Specifications

CONSTRUCTION & MATERIALS

- · Die cast aluminum housing
- · Tool-less entry
- Mounts on 1.25" IP (1.66" [42mm] O.D.) or 2" IP (2.375" [60mm] O.D.) horizontal tenon (minimum 8" [203mm] in length) and is adjustable +/-5° to allow for fixture leveling (includes two axis T-level to aid in leveling)
- Designed with 0-10V dimming capabilities. Controls by others
- Exclusive Colorfast DeltaGuard* finish features an E-Coat epoxy primer with an ultradurable powder topcoat, providing excellent resistance to corrosion, ultraviolet degradation and abrasion. Standard is silver. Black, bronze, platinum bronze and white are also available

ELECTRICAL SYSTEM

• Input Voltage: 120-277V or 347-480V, 50/60Hz

· Class 2 output

· Power Factor: > 0.9 at full load

• Total Harmonic Distortion: < 20% at full load

• Integral 10kV surge suppression protection standard

To address inrush current, slow blow fuse or type C/D breaker should be used.

REGULATORY & VOLUNTARY QUALIFICATIONS

- cULus Listed
- · Suitable for wet locations
- Product qualified on the DesignLights Consortium ("DLC") Qualified Products List ("QPL"). Exceptions apply when N, U, or Q options are ordered - see Field Adjustable Output spec sheet for details.
- Certified to ANSI C136.31-2001, 3G bridge and overpass vibration standards
- 10kV surge suppression protection tested in accordance with IEEE/ANSI C62.41.2
- Meets CALTrans 611 Vibration testing and GR-63-CORE Section 4.4.1/5.4.2 C62.41.2
- Luminaire and finish endurance tested to withstand 5,000 hours of elevated ambient salt fog conditions as defined in ASTM Standard B 117
- RoHS Compliant
- Meets Buy American requirements within ARRA

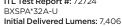
PATENTS

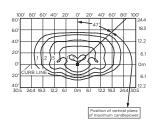
 Visit website for patents that cover these products: Patents http://www.cree.com/patents

Photometry

All published luminaire photometric testing performed to IESNA LM-79-08 standards by Independent Testing Laboratories, a NVLAP certified laboratory.







BXSPA*32A-U Mounting Height: 25' (7.6m) Initial Delivered Lumens: 7,000 Initial FC at grade.

Lumen Output, Electrical, and Lumen Maintenance Data

	Type 3 Distribution														
	Input Power Designator	4000K		5700K				TOTAL C	URRENT			TOTAL CURRENT		50K Hours	
Module		Initial Delivered Lumens	BUG Ratings** Per TM-15-11	Initial Delivered Lumens	BUG Ratings** Per TM-15-11	System Watts 120-277V	120V	208V	240V	277V	System Watts 347-480V	347V	480V	Calculated Lumen Maintenance Factor @ 15°C (59°F)***	
Standard	А	7,000	B2 U0 G1	7,700	B2 U0 G2	101	0.84	0.50	0.44	0.39	106	0.31	0.22	91%	
High Efficacy*	А	9,612	B2 U0 G2	10,680	B2 U0 G2	101	0.84	0.50	0.44	0.39	106	0.31	0.22	91%	

	Type 3 Distribution w/ BLS														
		4000K		5700K			TOTAL CURRENT					TOTAL CURRENT		50K Hours	
Module	Input Power Designator	Initial Delivered Lumens	BUG Ratings** Per TM-15-11	Initial Delivered Lumens	BUG Ratings** Per TM-15-11	System Watts 120-277V	120V	208V	240V	277V	System Watts 347-480V	347V	480V	Calculated Lumen Maintenance Factor @ 15°C (59°F)***	
Standard	А	6,130	TBD	6,742	TBD	101	0.84	0.50	0.44	0.39	106	0.31	0.22	91%	
High Efficacy*	Α	8,417	TBD	9,352	TBD	101	0.84	0.50	0.44	0.39	106	0.31	0.22	91%	

^{*} Available Q3 2012. Preliminary data shown

EPA and Weight

Input	Weight	Weight		EPA										
Power Designator	120-277V	347-480V	1@90	2@90	2@180	3@90	4@90							
А	26 lbs (12kg)	29 lbs (13.2kg)	0.692	1.140	1.384	1.832	2.280							

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^{**} For more information on the IES BUG (Backlight-Uplight-Glare) Rating visit www.iesna.org/PDF/Erratas/TM-15-11BugRatingsAddendum.pdf

^{***} Projected L₇₀ (6K) Hours: >36,000. For recommended lumen maintenance factor data see TD-13



ADVANCED LED TECHNOLOGY LED CANDLE LAMP - GLEAR

25W Replacement

Product Features

- True LED Replacement for 25W Incandescent Lamp
- Incandescent Lamp Appearance and Soft Light Quality
- Clear Glass Lamp with Optical Diffuser
- Advanced, Driver Free LED Technology

Product Specifications –

• Bulb Type: Clear CA10 Bent Tip Candle Lamp

Bulb Base: E12Total Lumens: 180lm

• Wattage: 3W

Wattage Replacement: 25W Incandescent
 Kelvin Temperature: 2700K - Warm White

Lamp Life: 50,000 HoursDimmable: 100% to 10%

• Light Distribution: Optical Light Refractor for Even Light Distribution

• Application: Indoor or Outdoor (Enclosed Fixture Only)

• Bulb Size - MOL: 1.3" Dia., 3.5" OA

• Operating Voltage: 120VAC Direct Input, Driver Free Technology

Certification: CSA-US
Contains No Mercury
Warranty: 5 Years

Ordering Information

Model No.: LCA12C18027K1UPC No.: 853454003376

• Packing: 12pcs per Shipping Carton - 1.7lb

48pcs per Master Carton - 6.7lb



LDL LED List Qualified:

Qualifies for the Lighting Design Lab's LED List for one year ending 9-16-2013. See the list at "www.lightingdesignlab.com".

US Patent # 8,067,891 B2 / 7,635,201 B2 Other US and Foreign Patents Pending



Typical Applications

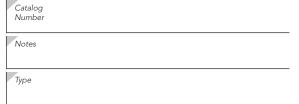




D-Series Size 3 LED Flood Luminaire







lit the Tab key or mouse over the page to see all interactive elements

Specifications

EPA: 1.4 ft² (0.13 m²)

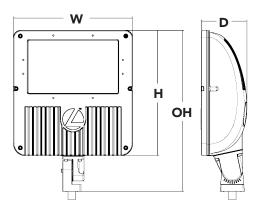
Depth: 5" (12.7 cm)

Width: 13"

Height: 13-5/8" (34.6 cm)

Overall 17-1/2" Height (44.5 cm)

Weight: 21 lbs



Introduction

The D-Series Size 3 Flood features precision optics to beautifully illuminate a variety of applications as its sleek, compact styling blends seamlessly with its environment.

The D-Series Flood reflector systems and cuttingedge chip-on-board LED technology produce low field-to-beam ratios for minimal spill light and incredible photometric performance. It's the ideal long-life replacement for 250 - 400W metal halide floods, with typical energy savings of 67% and expected service life of over 100,000 hours.

Ordering Information

EXAMPLE: DSXF3 LED 8 A530/40K FL MVOLT THK DDBXD

DSXF3 LED							
Series	Light Engines	Performance Package	Distribution	Voltage	Mounting	Options	Finish (required)
DSXF3 LED	Six COB enginesEight COB engines	530 mA options: A530/30K 3000K A530/40K 4000K A530/50K 5000K	NSP Narrow spot MSP Medium spot MFL Medium flood FL Flood WFL Wide flood WFR Wide flood, rectangular HMF Horizontal medium flood	MVOLT ¹ 120 ¹ 208 ¹ 240 ¹ 277 ¹ 347 480	Shipped included THK Knuckle with 3/4" NPT threaded pipe YKC62 Yoke with 16-3 SO cord IS Integral slipfitter (fits 2-3/8" 0.D. tenon) Shipped separately ² FTS CG6 Tenon slipfitter (fits 2-3/8" to 2-7/8" 0.D. tenon, YKC62 required)	Shipped installed PER NEMA twist-lock receptacle only (no controls) DMG 0-10V dimming driver (no controls) DCR Dimmable and controllable via ROAM® (no controls) 3 SF Single fuse (120, 277, 347V) 4 DF Double fuse (208, 240, 480V) 4 WTB Utility terminal block Shipped separately² UBV Upper/bottom visor (universal) FV Full visor VG Vandal guard WG Wire guard SC Shorting cap 5 DLL127F 1.5 JU Photocell – SSL twist-lock (347V) 5 DLL347F 1.5 CUL JU Photocell – SSL twist-lock (480V) 5	DDBXD Dark bronze DBLXD Black DNAXD Natural aluminum DWHXD White

Accessories

Ordered and shipped separately

FTS CG6 DDBXD U Slipfitter for 2-3/8" to 2-7/8" OD tenons; mates with yoke mount (specify finish)

FRWB DDBXD U Radius wall bracket, 2-3/8" OD tenon (specify finish)

FSPB DDBXD U Steel square pole bracket, 2-3/8" OD tenon (specify finish)

DSXF3UBV DDBXD U Upper/bottom visor accessory (specify finish)
DSXF3VF DDBXD U Full visor accessory (specify finish)
DSXF3VG U Vandal guard accessory
DSXF3WG U Wire guard accessory

For more mounting options, visit our Floodlighting Accessories pages For more control options, visit DTL and ROAM online.

NOTES

- MVOLT driver operates on any line voltage from 120-277V. Specify 120, 208, 240 or 277 options only when ordering with fusing (SF, DF options).
- 2 Also available as separate accessories; see Accessories information at left.
- 3 Specifies a ROAM® enabled luminaire with 0-10V dimming capability, PER option required. Not available with 347 or 480V. Additional hardware and services required for ROAM® deployment; must be purchased separately. Call 1-800-442-6745 or email: sales@roamservices.net.
- 4 Single fuse (SF) requires 120, 277 or 347 voltage option. Double fuse (DF) requires 208, 240 or 480 voltage option.
- 5 Requires luminaire to be specified with PER option. Ordered and shipped as a separate line item.



Performance Data

Lumen Output

Lumen values are from photometric tests performed in accordance with IESNA LM-79-08. Data is considered to be representative of the configurations shown, within the tolerances allowed by Lighting Facts. Actual performance may differ as a result of end-user environment and application. Contact factory for performance data on any configurations not shown here.

Light Engines	Drive Current	Performance Package	System Watts	Dist. Type	Field Angle		Beam Angle		40K (4000K, 70 CRI)			50K (5000K, 67 CRI)		
	(mA)				°H	°V	°Н	°V	Max Cd	Lumens	LPW	Max Cd	Lumens	LPW
				NSP	48	49	19	19	39,299	7471	65	39,177	7448	65
			MSP	50	48	24	23	36,284	8373	73	36,171	8347	73	
				MFL	60	60	47	46	15,104	8948	78	15,057	8920	78
6	530	A530/K	115W	FL	85	84	63	62	9985	9730	85	9954	9700	84
				WFL	106	106	71	72	7488	10,230	89	7465	10,199	89
				WFR	107	88	85	64	7460	10,461	91	7436	10,429	91
				HMF	100	62	80	13	6779	3301	29	6758	3290	29
				NSP	48	49	19	19	51,658	9820	62	51,496	9790	62
				MSP	50	48	24	23	47,694	11,006	70	47,546	10,971	69
				MFL	60	60	47	46	19,854	11,761	74	19,792	11,725	74
8	530	A530/K	158W	FL	85	84	63	62	13,125	12,790	81	13,084	12,750	81
				WFL	106	106	71	72	9843	13,448	85	9812	13,406	85
				WFR	107	88	85	64	9805	13,751	87	9775	13,708	87
				HMF	100	62	80	13	8911	4338	27	8883	4325	27

Lumen Ambient Temperature (LAT) Multipliers

Use these factors to determine relative lumen output for average ambient temperatures from 0-40°C (32-104°F).

Amb	ient	Lumen Multiplier			
0°C	32°F	1.05			
10°C	50°F	1.03			
20°C	68°F	1.01			
25°C	77°F	1.00			
30°C	86°F	0.99			
40°C	104°F	0.97			

Projected LED Lumen Maintenance

Data references the extrapolated performance projections for the **DSXF LED 8 A530** platform in a **25°C ambient**, based on 8400 hours of LED testing (tested per IESNA LM-80-08 and projected per IESNA TM-21-11).

To calculate LLF, use the lumen maintenance factor that corresponds to the desired number of operating hours below. For other lumen maintenance values, contact factory.

Operating Hours	0	25,000	50,000	100,000
Lumen Maintenance Factor	1.0	0.94	0.90	0.84

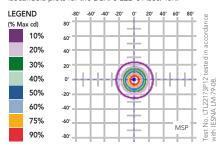
Electrical Load

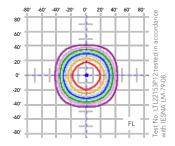
				Current (A)							
Light Engines	Drive Current (mA)	System Watts	120	208	240	277	347	480			
6	530	115W	1.06	0.61	0.53	0.46	0.37	0.27			
8	530	158W	1.46	0.84	0.73	0.63	0.51	0.37			

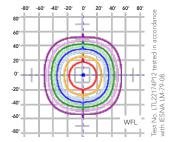
Photometric Diagrams

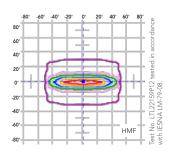
To see complete photometric reports or download .ies files for this product, visit Lithonia Lighting's D-Series Flood Size 3 homepage.

Isocandela plots for the DSXF3 LED 8 A530/40K.









FEATURES & SPECIFICATIONS

INTENDED USE

The sleek design of the D-Series Size 3 Flood reflects the embedded high performance LED technology. It is ideal for wallwash, security and general area lighting in many commercial and institutional applications.

CONSTRUCTION

Die-cast aluminum housing has integral heat sink fins to optimize thermal management through conductive and convective cooling. The LED driver is mounted in direct contact with the casting to promote low operating temperature and long life. Housing is completely sealed against moisture and environmental contaminants (IP65). Low EPA (1.4 ft?) for optimized wind loading.

FINISH

Exterior parts are protected by a zinc-infused Super Durable TGIC thermoset powder coat finish that provides superior resistance to corrosion and weathering. A tightly controlled multi-stage process ensures a minimum 3 mils thickness for a finish that can withstand extreme climate changes without cracking or peeling.

OPTICS

A variety of precision-molded vacuum-metallized specular reflectors are engineered for superior field-to-beam ratios, uniformity and spacing. Light engines are available in 3000K (80 CRI min.), 4000K (70 CRI min.) or 5000K (67 CRI min.) configurations. Optional visors offer additional versatility.

ELECTRICAL

Light engines consist of chip-on-board (COB) LEDs directly coupled to the housing to maximize heat dissipation and promote long life (100,000 hrs at 25°C, L84). Class 1 electronic driver has a power factor >90%, THD <20%, and has an expected life of 100,000 hours with <1% failure rate. (Eight-engine unit uses two drivers.) Surge protection meets a minimum Category C Low operation (per ANSI/IEEE C62.41.2).

INSTALLATION

Integral adjustable knuckle with 3/4-14 NPT threaded pipe, or yoke mounting, facilitates quick and easy installation to a variety of mounting accessories. This secure connection enables the D-Series Size 3 to withstand up to a 1.5 G vibration load rating per ANSI C136.31.

LISTINGS

CSA certified to U.S. and Canadian standards. Luminaire is IP65 rated. Rated for -40°C minimum ambient.

WARRANTY

Five year limited warranty. Full warranty terms located at www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx.

Note: Specifications subject to change without notice.



E-CORE" | Dimmable LED MR16 GU5.3

Project:	Toshiba Lamp:	
Type:	Notes:	

Ordering Information

Ordering Code	Input Voltage (VAC)	Lamp Shape	Base Type	Wattage (W)	CCT ¹	Beam Angle	Initial Lumens (lm) ²	Lamp Efficacy (lm/W)	Rated Life (hrs) ³	CBCP (cd)	CRI	Power Factor	Equivalency⁴	Lamp Weight lb (g)
6MR16/827SP8	12	MR16	GU5.3	6.2	2700K	8°	270	43.5	25,000	5500	80	>0.70	25W Halogen	0.11 (49)
7MR16/827NFL25	12	MR16	GU5.3	6.7	2700K	25°	300	44.8	25,000	1250	80	>0.70	20W Halogen	0.11 (49)
7MR16/827FL35	12	MR16	GU5.3	6.7	2700K	35°	300	44.8	25,000	700	80	>0.70	20W Halogen	0.11 (49)
6MR16/830SP8	12	MR16	GU5.3	6.2	3000K	8°	275	44.4	25,000	5600	80	>0.70	25W Halogen	0.11 (49)
7MR16/830NFL25	12	MR16	GU5.3	6.7	3000K	25°	310	46.3	25,000	1250	80	>0.70	25W Halogen	0.11 (49)
7MR16/830FL35	12	MR16	GU5.3	6.7	3000K	35°	310	46.3	25,000	700	80	>0.70	25W Halogen	0.11 (49)
6MR16/840SP8	12	MR16	GU5.3	6.2	4000K	8°	280	45.2	25,000	5700	85	>0.70	25W Halogen	0.11 (49)
7MR16/840NFL25	12	MR16	GU5.3	6.7	4000K	25°	320	47.8	25,000	1250	86	>0.70	25W Halogen	0.11 (49)
7MR16/840FL35	12	MR16	GU5.3	6.7	4000K	35°	320	47.8	25,000	700	86	>0.70	25W Halogen	0.11 (49)

^{1.} CCT Range complies to ANSI C78.377-2008.

Note: All Information consistent with IESNA LM-80-08 results and IESNA LM-79-08 testing completed by a qualified third party facility.

 $Note: All\ lamps\ meet\ Energy\ Star^{\circ}\ Integral\ LED\ Lamp\ requirements, and\ will\ be\ submitted\ for\ testing.$

Note: 5 Year Warranty for MR16 GU5.3 is based on 12 hr/day usage.







Dimensions

E-Core Model	MOL (A)	Diameter (B)
MR16 8° Spot	1.86" (47.4 mm)	1.96" (50 mm)
MR16 25° Narrow Flood	1.77" (45 mm)	1.96" (50 mm)
MR16 35° Flood	1.77" (45 mm)	1.96" (50 mm)

Note: Lamp shapes conform to ANSI C78.24-2001. Note: Designed to comply with RoHS Directive 2002/95/EC.



8° Spot







25° Narrow Flood & 35° Flood

Illuminance Cone Diagrams

	6MR16/830SP8				7MR16	5/830NFL25				7MR1	6/830FL35		
Wattage	6.2 CBCP (cd)	5600		Wattage	6.7	CBCP (cd)	1250		Wattage	6.7	CBCP (cd)	700	
Lumens	275 Beam Angle	8°		Lumens	310	Beam Angle	25°		Lumens	310	Beam Angle	35°	
Distance			Distance					Distance			Ä		
feet	Footcandles	Ţ	feet	Footcar	ndles			feet	Footcana	lles	<u> </u>	<u> </u>	
2′	1400	Ø 0.3'	2′	300)		Ø 0.9'	2′	175			Ø 1.3	
4′	350	Ø 0.7'	4′	78			Ø 1.8'	4′	44			Ø 2.5	
6′	156	Ø 1.0'	6′	35			Ø 2.7'	6′	19			Ø 3.8	;
8′	88	Ø 1.4'	8′	20	/		Ø 3.5'	8′	11				5.0
10′	56	Ø 1.7'	10'	13	<u> </u>		Ø 4.4	10'	7	_<			Ø 6.3

Energy Savings

	20W Halogen	25W Halogen	35W Halogen	50W Halogen
6MR16/830SP8	\$37.95	\$51.70*	\$79.20	\$120.45
7MR16/830NFL25	\$36.58	\$50.33*	\$77.83	\$119.08
7MR16/830FL35	\$36.58	\$50.33*	\$77.83	\$119.08

^{*}Actual Equivalent Replacement, based on the Energy Star* Integral LED Lamp Center Beam Intensity Benchmark Tool.

Note: Energy Savings based on using one bulb for 25,000 hr rated life at 11¢/kWh. Does not include maintenance and replacement lamp savings.

Ordering Guide

6	MR16	/	827	SP8
Wattage	Lamp Type		CRI + CCT	Beam Angle
6.2 Watts = 6	MR16 GU5.3	= MR16	80 CRI + 2700 K = 827	Spot 8°= SP8
6.7 Watts = 7			80 CRI + 3000K = 830 86 CRI + 4000K = 840	Narrow Flood 25° = NFL25 Flood 35° = FL35



Available for all color temperatures

^{2.} Thermally stable typical lumens (± 10%)

^{3.} Rated life is based on 70% lumen maintenance, and engineering testing and probability analysis.

^{4.} Equivalency based on the Energy Star® Integral LED Lamp Center Beam Intensity Benchmark Tool.

TOSHIBA

E-CORE[™] | Dimmable LED PAR20

Project:	Toshiba Lamp:
Type:	Notes:

Ordering Information

Ordering Code	Input Voltage (VAC)	Lamp Shape	Base Type	Wattage (W)	CCT 1	Beam Angle	Initial Lumens (lm) ²	Lamp Efficacy (lm/W)	Rated Life (hrs) ³	CBCP (cd)	CRI	Power Factor	Equivalency ⁴	Lamp Weight Ib (g)
9P20/827SP8	120	PAR20	E26	8.6	2700K	8°	380	44.2	40,000	6600	80	>0.70	60W Halogen	0.38 (172)
9P20/827NFL25	120	PAR20	E26	9.0	2700K	25°	390	45.3	40,000	1600	80	>0.70	55W Halogen	0.41 (186)
9P20/830SP8	120	PAR20	E26	8.6	3000K	8°	385	44.8	40,000	6700	81	>0.70	60W Halogen	0.38 (172)
9P20/830NFL25	120	PAR20	E26	9.0	3000K	25°	400	46.5	40,000	1600	80	>0.70	55W Halogen	0.41 (186)

- 1. CCT Range complies to ANSI C78.377-2008.
- 2. Thermally stable typical lumens (± 10%)
- 3. Rated life is based on 70% lumen maintenance, and engineering testing and probability analysis.
- 4. Equivalency based on the Energy Star® Integral LED Lamp Center Beam Intensity Benchmark Tool.

Note: All Information consistent with IESNA LM-80-08 results and IESNA LM-79-08 testing completed by a qualified third party facility.

Note: All lamps meet Energy Star® Integral LED Lamp requirements, and will be submitted for testing.

Note: 5 Year Warranty based on 24 hr/day usage.



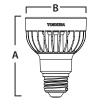




Dimensions

 E-Core Model	MOL (A)	Diameter (B)
PAR20	3.26" (82.7 mm)	2.48" (63 mm)

Note: Lamp shape conforms to ANSI C78.21-2003. Note: Designed to comply with RoHS Directive 2002/95/EC.





Illuminance Cone Diagrams

	9P20/830SP	8				9P20	0/830NFL25	
Wattage	8.6 CE	BCP (cd)	6700		Wattage	9.0	CBCP (cd)	1600
Lumens	385 Bear	n Angle	8°		Lumens	400	Beam Angle	25°
Distance feet 2'	Footcandles 1675		Ø 0.3'	Distance feet 2'	Footco 40			Ø 0.9'
4′	419		Ø 0.3	4′	10	00		Ø 1.8'
6′	186		Ø 1.0'	6′	4	4		Ø 2.7'
8′	105		Ø 1.4'	8′	2	5		Ø 3.5'
_10′	67		Ø 1.7'	10'	1	6{		Ø 4.4'

Energy Savings

	20W Halogen	35W Halogen	55W Halogen	60W Halogen
9P20/830SP8	\$50.16	\$116.16	\$204.16	\$226.16*
9P20/830NFL25	\$48.40	\$114.40	\$202.40*	\$224.40

^{*}Actual Equivalent Replacement, based on the Energy Star® Integral LED Lamp Center Beam Intensity Benchmark Tool.

Note: Energy Savings based on using one bulb for 40,000 hr rated life at 11¢/kWh. Does not include maintenance and replacement lamp savings.

Ordering Guide

9	P20 /	827	SP8
Wattage 8.6/9.0 Watts = 9	Lamp Type PAR20 = P20	CRI + CCT 80 CRI + 2700K = 827 80 CRI + 3000K = 830	Beam Angle Spot 8°= SP8 Narrow Flood 25° = NFL25



E-CORE[®] | Dimmable LED PAR38

Project:	Toshiba Lamp:
Type:	Notes:

5 FIVE YEAR WARRANTY

lighting

Ordering Information

Ordering Code	Input Voltage (VAC)	Lamp Shape	Base Type	Wattage (W)	CCT ¹	Beam Angle	Initial Lumens (lm) ²	Lamp Efficacy (lm/W)	Rated Life (hrs) ³	CBCP (cd)	CRI	Power Factor	Equivalency ⁴	Lamp Weight Ib (g)
19P38/827SP8	120	PAR38	E26	19.2	2700K	8°	900	47.4	40,000	14200	81	>0.70	70W Halogen	1.09 (495)
20P38/827NFL25	120	PAR38	E26	20.3	2700K	25°	970	47.8	40,000	3400	80	>0.70	75W Halogen	1.18 (535)
20P38/827FL35	120	PAR38	E26	20.3	2700K	35°	970	47.8	40,000	1800	80	>0.70	75W Halogen	1.18 (535)
19P38/830SP8	120	PAR38	E26	19.2	3000K	8°	920	47.9	40,000	14350	81	>0.70	75W Halogen	1.09 (495)
20P38/830NFL25	120	PAR38	E26	20.3	3000K	25°	1000	49.3	40,000	3500	80	>0.70	75W Halogen	1.18 (535)
20P38/830FL35	120	PAR38	E26	20.3	3000K	35°	1000	49.3	40,000	1900	80	>0.70	80W Halogen	1.18 (535)
19P38/835SP8	120	PAR38	E26	19.2	3500K	8°	930	48.4	40,000	14500	82	>0.70	75W Halogen	1.09 (495)
20P38/835NFL25	120	PAR38	E26	20.3	3500K	25°	1000	49.3	40,000	3500	85	>0.70	75W Halogen	1.18 (535)
20P38/835FL35	120	PAR38	E26	20.3	3500K	35°	1000	49.3	40,000	1900	85	>0.70	80W Halogen	1.18 (535)
19P38/840SP8	120	PAR38	E26	19.2	4000K	8°	940	49.0	40,000	14600	84	>0.70	75W Halogen	1.09 (495)
20P38/840NFL25	120	PAR38	E26	20.3	4000K	25°	1000	49.3	40,000	3500	86	>0.70	75W Halogen	1.18 (535)
20P38/840FL35	120	PAR38	E26	20.3	4000K	35°	1000	49.3	40,000	1900	86	>0.70	80W Halogen	1.18 (535)

^{1.} CCT Range complies to ANSI C78.377-2008.

Note: All Information consistent with IESNA LM-80-08 results and IESNA LM-79-08 testing completed by a qualified third party facility.

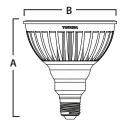
Note: All lamps meet Energy Star® Integral LED Lamp requirements, and will be submitted for testing.

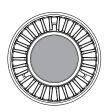
Note: 5 Year Warranty based on 24 hr/day usage.

Dimensions

E-Core Model	MOL (A)	Diameter (B)
PAR38	5.01" (127 mm)	4.76" (121 mm)

Note: Lamp shape conforms to ANSI C78.21-2003. Note: Designed to comply with RoHS Directive 2002/95/EC.





Illuminance Cone Diagrams

	19P38/830	SP8				20P38	3/830NFL25				20P38	3/830FL35		
Wattage	19.2	CBCP (cd)	14350		Wattage	20.3	CBCP (cd)	1900		Wattage	20.3	CBCP (cd)	3500	
Lumens	920 Bea	am Angle	8°		Lumens	1000	Beam Angle	25°		Lumens	1000	Beam Angle	35°	
Distance feet	Footcandles			Distance feet	Footco	andles		.	Distance feet	Footcana	lles		<u> </u>	
2′	359	\perp	Ø 0.3'	2′	87	'5		Ø 0.9'	2′	475			Ø 1.3	
4′	897		Ø 0.7'	4′	21	9		Ø 1.8'	4′	119			Ø 2.5	
6′	399	\downarrow	Ø 1.0'	6′	9	7		Ø 2.7'	6′	53			Ø 3.8	
8′	224		Ø 1.4'	8′	5	5		Ø 3.5'	8′	30			Ø 5.0	
10′	144		Ø 1.7'	10′	3	5		Ø 4.4'	10′	19			Ø6	.3

Energy Savings

	45W Halogen	60W Halogen	75W Halogen	80W Halogen	90W Halogen	120W Halogen
19P38/830SP8	\$113.52	\$179.52	\$245.52*	\$267.52	\$311.52	\$443.52
20P38/830NFL25	\$108.68	\$174.68	\$240.68*	\$262.68	\$306.68	\$438.68
20P38/830FL35	\$108.68	\$174.68	\$240.68	\$262.68*	\$306.68	\$438.68

^{*}Actual Equivalent Replacement, based on the Energy Star* Integral LED Lamp Center Beam Intensity Benchmark Tool.

Note: Energy Savings based on using one bulb for 40,000 hr rated life at 11¢/kWh. Does not include maintenance and replacement lamp savings.

Ordering Guide

19	P38	1	827	SP8
Wattage	Lamp Ty	pe	CRI + CCT	Beam Angle
19.3 Watts = 19	PAR38 =	P38	80 CRI + 2700 K = 827	Spot 8°= SP8
20.3 Watts = 20			80 CRI + 3000 K = 830	Narrow Flood 25° = NFL25
			85 CRI + 3500K = 835	Flood 35° = FL35
			86 CRI + 4000K = 840	



^{2.} Thermally stable typical lumens (± 10%)

^{3.} Rated life is based on 70% lumen maintenance, and engineering testing and probability analysis.

^{4.} Equivalency based on the Energy Star® Integral LED Lamp Center Beam Intensity Benchmark Tool.

FINELITE

## ## ## ## ## ## ## ## ## ## ## ## ##	Date	
	Project	
DIMS To OFF	Type ration	
	Comments	
DESCRIPTION		
Edge by Finelite delivers the right amount of task illumination for a fraction of the energy required by conventional undercabinet luminaires. Available in three different sizes, Edge by Finelite can be used as a stand alone unit, daisy chained or in conjunction with Finelite LED desk lamps. Use it to create pleasant and sustainable work areas that allow for true occupant control.	PS	



LIGHT ENGINE

Edge uses mid-powered LEDs spaced uniformly for even distribution on the task plane.



EVEN GLOW™ DIFFUSER

Edge's Even Glow diffuser covers the LEDs for improved distribution, minimizes multiple shadow effects, and is easy to clean for applications requiring periodic wipe down.



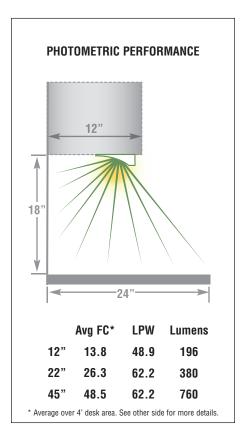
FULL RANGE, ON-BOARD DIMMING TO OFF

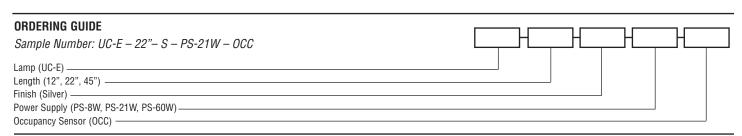
Edge comes equipped with individual dimming to off on each luminaire.



POWER SUPPLIES:

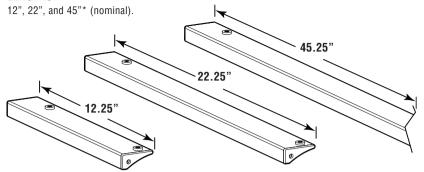
Available with 8W, 21W, or 60W power supplies. 21W and 60W power supplies include (4) 2.5 MM output jacks and one RJ11 jack for an optional occupancy sensor. 8W power supply includes (1) 2.5 mm output jack. (Refer to Power Supply Tech Sheet for more information.)





Finelite, Inc. • 30500 Whipple Road • Union City, CA 94587-1530 • 510 / 441-1100 • Fax: 510 / 441-1510 • www.finelite.com

LENGTHS:



OCCUPANCY SENSOR Optional occupancy sensor available for use with 21W or 60W power supply. 0.85" **Actual Size**

NOTE: * 45" Edge undercabinet cannot be daisy chained. One 21W Power Supply is required for 45" length.

5 year warranty on all Edge by Finelite components.

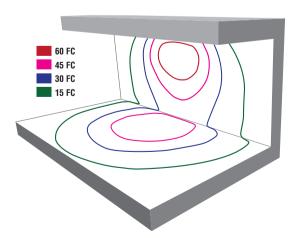
TECHNICAL SPECIFICATIONS

- . Buy American Act of 2009 Compliant
- Efficacy (Lumens per Watt): 45": 62.2* / 22": 62.2 / 12": 48.9
- Light Output (Lumens): 45": 760* / 22": 380 / 12": 196
- Power Consumption: 45": 12.2W* / 22": 6.1W / 12": 4W
- · Color Temperature: 3500K
- Color Rendering (CRI): 87
- R9 Value: 22": 32 / 12": 34
- L₉₀: Rated for 100,000 hours to 90% of initial lumens **
- · LM-79 tested and LM-80 data is available
- · Complies with FCC requirements for commercial and residential use
- Compatible with Personal Lighting System (PLS)
- End of life statement: 86% recyclable at the end of its useful life
- · ETL Listed
- RoHS Compliant
- * 45" performance is projected.
- ** Lan lifetime is estimated by the LED manufacturer based on independent testing of the Edge luminaire.

RARE EARTH MAGNETS Powerful rare earth super magnets provided pre-installed for mounting directly on steel. Rare earth super-magnets provided pre-installed for mounting directly on stee

PHOTOMETRIC PERFORMANCE

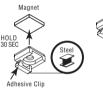
Superior lateral throw provides proper illumination over a wide area. Example below: 22" unit installed on a 4' binder bin.



One 22" Edge provides ample illumination beneath a 4' binder area. For additional output specify a 45" luminaire rather than two 22" luminaires.

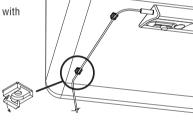
CABLE MANAGEMENT HARDWARE

For best results, clean magnet or cabinet surface with isopropyl alcohol before applying adhesive clip.









CABLES

Edge by Finelite comes standard with (1) 12' power cable and cable management hardware.

Power Cables

To Power Supply To Luminaire Cat No. CPNC-12

[12' Power Cable]

Patch Cables

To Luminaire To Luminaire Daisy chains two male 1.3mm jacks. Cat No. CP-3 Cat No. CP-6 Cat No. CP-14

[3" Patch Cable] [6" Patch Cable] [14" Patch Cable]

Cat No. CP-28

[28" Patch Cable]

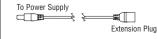
Splitter Cable

To Power Supply

Cat No. CY-6

[6" Splitter Cable]

Extension Cable



Cat No. CX-8

[8' Extension Cable]

PSE Schedule 258 Grant Application

5) FUNDING ANALYSIS



CLIENT NAME: WA DEPARTMENT OF ENTERPRISE SERVICES
JOB/PROJECT NAME: PSE SCHEDULE 258 GRANT / WA GOVERNOR'S RESIDENCE
DATE: 16 JULY 2013

Funding Analysis Sheet - WA State Governor's Residence

	Electric			
	Space			Comfort
Measure Life	Heating	Lighting	Other	Cooling
	1	2	3	4
1		0.10387	0.08373	0.05537
2	0.32990	0.20293	0.16374	0.10835
3	0.50175	0.31707	0.26001	0.17800
4	0.66403	0.42503	0.35101	0.24429
5	0.81761	0.52647	0.43626	0.30533
6	0.96349	0.62232	0.51692	0.36243
7	1.10122	0.71182	0.59202	0.41456
8		0.79682	0.66343	0.46415
9		0.87744	0.73117	0.51141
10	1.47243	0.95368	0.79509	0.55616
11	1.58308	1.02561	0.85526	0.59802
12	1.68767	1.09363	0.91224	0.63765
13	1.78656	1.15808	0.96625	0.67531
14	1.87997	1.21904	1.01730	0.71097
15	1.96967	1.27717	1.06592	0.74459
16	2.05405	1.33183	1.11152	0.77620
17	2.13361	1.38337	1.15452	0.80604
18		1.43200	1.19512	0.83405
19	2.28049	1.47820	1.23369	0.86058
20		1.52186	1.27012	0.88573
21	2.41154	1.56281	1.30422	0.90916
22	2.47131	1.60122	1.33614	0.93099
23	2.52754	1.63726	1.36604	0.95134
24	2.58045	1.67106	1.39403	0.97030
25	2.63023	1.70277	1.42024	0.98797
26	2.67709	1.73252	1.44479	1.00443
27	2.72118	1.76044	1.46778	1.01977
28	2.76267	1.78663	1.48931	1.03406
29	2.80173	1.81121	1.50947	1.04738
30	2.83849	1.83428	1.52836	1.05979

Annual Savings 17,985 kWh
Measure Cost \$19,465 Dollars
Measure Type Lighting
Measure Life 12 years

Cost Effectiveness Factor 1.09363 \$/kWh

G1 \$8,993 G2 \$19,669 G3 \$26,712 Estimated Max Grant 258 **\$8,993**

PSE Schedule 258 Grant Application

6) PROJECT TIMELINE

The following information lists several milestone dates for the project.

	<u>Start</u>	<u>Finish</u>
Schedule 258 Proposal	7/16/2013	7/16/2013
PSE Review	7/17/2013	7/24/2013
Notification of Grant Award	9/17/2013	9/17/2013
Intent to Proceed	10/01/2013	10/01/2013
Design and Pre-Construction	10/01/2013	10/14/2013
Construction	10/14/2013	12/13/2013
Testing & Commissioning	12/16/2013	12/20/2013
Project Close Out	12/20/2013	12/20/2013



CLIENT NAME: WA DEPARTMENT OF ENTERPRISE SERVICES

JOB/PROJECT NAME: PSE SCHEDULE 258 GRANT / WA GOVERNOR'S RESIDENCE

DATE: 16 JULY 2013

PSE Schedule 258 Grant Application

7) VERIFICATION PLAN

The project performance will be verified using field inspections.

- 1. Perform light level survey in a sample of the rooms
- 2. Verify a sample of the installed fixtures are per specifications



CLIENT NAME: WA DEPARTMENT OF ENTERPRISE SERVICES

JOB/PROJECT NAME: PSE SCHEDULE 258 GRANT / WA GOVERNOR'S RESIDENCE
DATE: 16 JULY 2013



Governor's Mansion Air Leakage Inspection Report















Buildings: Governor's Mansion

Contact: Steve Tratt

stratt@canambuildingenvelope.com

519-217-6336

Submittal

Date: July 3, 2013

Roofing & Building Maintenance Division



888-250-1570 canambuildingenvelope.com





TABLE OF CONTENTS

EXECUTIVE SUMMARY	(1)
Project Description	3
Inspection Findings	(1)
Recommendations	4
Energy Savings and Payback	_
Financial Impact	6
SIGNIFICANT ISSUES	7
RECOMMENDED SCOPE OF WORK	8
APPENDIX A - PHOTOGRAPHS	S
APPENDIX B - CASH FLOW ANALYSIS	1
PROJECT APPROVAL	2



PROJECT DESCRIPTION

OF THE ROOFING AND
BUILDING MAINTENANCE
DIVISION OF TREMCO
INCORPORATED, IS
PLEASED TO PRESENT
THIS AIR LEAKAGE
INSPECTION AND
RECOMMENDATIONS
REPORT TO MCKINSTRY
FOR GOVERNOR'S

MANSION.

CANAM, AN AFFILIATE

On May 24, 2013, Canam conducted an on-site building envelope inspection which included a visual inspection and a smoke pencil air leakage test to confirm energy loss and moisture issues for the following buildings located in Olympia, WA:

Governor's Mansion

In addition to the on-site inspection, Canam reviewed building construction and building performance issues with facility management to understand current conditions and priority needs.

An analysis of historical energy costs was also completed to determine how the condition of the building envelope currently affects energy consumption. Potential financial saving projections associated with air sealing determined the project's economic benefit.

INSPECTION FINDINGS

On-site testing and the analysis of historical energy consumption indicate there is an opportunity to improve Governor's Mansion's indoor air quality, occupant comfort and energy use by upgrading existing air barrier systems.

Our inspection of 1 building, totaling 18,000 square feet, revealed gaps, cracks and holes in the building envelope. When converted to their square feet equivalency, these holes total:

 Governor's Mansion: 10.00 Sq. Ft.

RECOMMENDATIONS

Building envelope air sealing, weatherstripping, and interior compartmentalization is recommended to eliminate the infiltration and exfiltration of air to reduce energy loss while improving occupant safety and comfort.



RECOMMENDATIONS

The scope of work for Governor's Mansion includes weather-stripping and sealing the following building components, which have failed to varying degrees. (See Appendix A for photos and details.)

• Doors - Exterior

Mechanical Room

Windows

• Attic - Insulation

• Basement Crawlspace - Insulation

Canam's turnkey air barrier solution includes material specification, material procurement and installation services. Also included is on-site project management to ensure quality control. The cost to implement Canam's air barrier solution is reflected in the following table. Potential savings from utility, federal, provincial and local incentive programs will be investigated upon project execution.

BUILDING NAME	SQ. FT. LEAKAGE AREA	PRICE
Governor's Mansion	10.00	\$ 74,403
TOTAL:	10.00	\$ 74,403



ENERGY SAVINGS AND PAYBACK

Canam's analyses confirmed there is an opportunity for Governor's Mansion to reduce energy consumption by eliminating building envelope air leaks.

Calculated by a Certified Energy Manager (CEM), our analysis of Governor's Mansion's building and utility rates, determined that the reduction of energy consumption from the Canam solution will produce significant savings. Based upon your current cost of energy within your climate zone, air sealing measures as defined in this report will result in an annual energy savings of \$2,423 the equivalent of \$0.13 per square foot. These air sealing measures will reduce your energy consumption and will lower your Energy Utilization Index (EUI)* by 9.21 kBu per square foot.

*EUI converts both gas and electric consumption into Btu's, enabling the comparison of a building's energy intensity.



5

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FINANCIAL IMPACT

The financial impact of Canam's recommended air barrier solution is reflected below:

GOVERNOR'S MANSION	
Total Investment Requirement	\$ 74,403
Annual Savings	\$ 2,423
Payback Years	30.7

This offer remains valid for 120 days after submittal date.

Please see the Appendix for the cash flow statement.



GOVERNOR'S MANSION

GENERAL CONDITIONS

This is a 1908 building built of brick and concrete. This building has had a few additions, and has been upgraded from time to time. There are no apparent structural issues or moisture issues. This building is consistent with buildings of similar age, as there was no insulation when it was built, some added later, however, the building is still in need of updated quantities of insulation in the attic and crawl spaces.

A blower door test was applied to this building to quantify the leakage rate and to assist in smoke pencil tests. We had 6 blower doors and over 6 technicians to assure accuracy.

CRITICAL AIR LEAKAGE

The critical areas of leakage were clearly the old windows that had no weather-stripping to assure air tightness. The windows are old, single-hung wood windows that will need to be sealed. All the doors in the building were identified to be leaky and require new weather-strip materials. Those doors with the weather-seals intact appear to have a poor quality of weather-stripping.

The attic was another source of leakage, due to chases around the chimneys and up the sides of the walls, in some cases they were balloon walls. This leaks directly out the venting and should be sealed.

The small Mechanical Room on the 3rd Floor is very leaky under the dormer. Although past measures were used to stop insects and rodents, the screen material does not stop air travel freely in and out of the building.

In addition, the overhead doors in the Shop and Refuel area leak and need to be re-weather-stripped.

INDOOR AIR QUALITY

There did not appear to be any significant indoor air quality issues noted during the investigation.

CONCLUSION

Installing new insulation in the attic and crawl spaces, and performing the air sealing measures in the areas recommended, will significantly reduce unintentional air leakage, reduce heating and cooling costs, as well as improve the HVAC system's ability to maintain the building at its desired temperatures, improving occupant comfort.



7

A TURNKEY SOLUTION PROVIDED BY CANAM INCLUDES THE MATERIAL AND INSTALLATION OF WEATHER-STRIPPING AND SEALING OF ALL ACCESSIBLE BUILDING COMPONENTS, INCLUDING THOSE LISTED BELOW. THE INDIVIDUAL RECOMMENDED SCOPE OF WORK IS DETAILED FOR EACH BUILDING BASED ON THE PROBLEM AREAS IDENTIFIED DURING THE ASSESSMENT.

• Roof Exhausts

Roof Hatches/Doors

• Exterior Doors

• Interior Doors

• Overhead Doors

• Roll-Up Doors • Sta

Stairwell Doors

• Interior Shafts

• Mechanical Room

Windows

Soffits

• Electrical Receptacles

Chase Ways

• Shafts (floor-to-floor)

Skylights

• Roof/Wall Intersections

GOVERNOR'S MANSION				
Component	Existing Condition	Recommendation		
Mechanical Room	Leaky under dormer	Screen material does not stop air infiltration; seal properly		
Windows	Poor, leaky	Install weather-stripping		
Exterior Doors	Poor, all leak	Install weather-striping and door sweeps		
Attic	Leaky	Install insulation		
Crawlspace	Leaky	Install insulation		



GOVERNOR'S MANSION

- A. Exterior of Governor's Mansion.
- B. Attic is in need of additional insulation.



A.



В.



SECTION 4 | APPENDIX A



- C. Many gaps around chimney need to be sealed and R-value increased.
- D. Another photo that shows areas in the Attic where there is missing insulation that should be upgraded.

C.



D.



SECTION 4 | APPENDIX A

- E. Attic in need of insulation.
- F. No insulation present in this area of the Attic.



E.



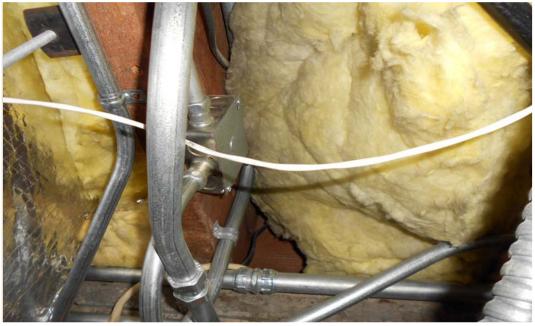
F.





- G. Insulation pulled back, with large gaps exposed where unwanted air can infiltrate into rooms below.
- H. Insulation installed upside down in Crawlspace.
 Needs to be corrected and poly installed on dirt floor.

G.



Н.



SECTION 4 | APPENDIX A

- I. Another area of the Crawlspace where additional insulation is needed either to increase R-value, or because there is no insulation at all.
- J. Crawlspace vents need to be insulated and weather-stripped.



i.



J.





- K. Another photo showing the Basement Crawlspace that needs to be air sealed.
- L. Screen put in to keep rodents and insects out of the 3rd Floor Mechanical Room, however, this area needs to be air sealed.

K.



BUILDING ENVELOPE SPECIALISTS INC.

SECTION 4 | APPENDIX A

- M. Windows are very leaky and need to be sealed.
- N. Operable windows have no weather-stripping and need to be sealed.



M.



N.





- O. When windows were tested with the smoke pencil, air leakage was detected.

 Notice the gap around the window.
- P. All style of windows need to be sealed.

0.



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SECTION 4 | APPENDIX A

- Q. Smoke pencil test indicates air travels freely inside and outside the building. Notice the very large crack. Weatherstripping needs to be installed.
- R. Double-doors need weatherstripping installed. No need to even test with the smoke pencil due to the large gap between the doors and the fact that daylight is visible through the crack.



Q.



R.





- S. Smoke pencil testing on other doors also indicated air leakage.
- T. All doors need to be weather-stripped and sweeps attached.

S.



T.



SECTION 4 | APPENDIX A

- U. Blower door test.
- V. Another photo of the blower door.



U.



V.



CASH FLOW ANALYSIS



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Project Approval

ACCOUNT: McKinstry | 5005 3rd Ave. S | Seattle, WA 98134 BUILDING: Governor's Mansion

COSTS:

\$74,403

PROJECT APPROVAL:

Please provide Purchase Order number to WTC, sign, and date:

Purchase Order Number:

Signature:

Date:

Title:

CONTACT:

Steve Tratt stratt@canambuildingenvelope.com 519-217-6336

Tremco, Inc. 3735 Green Road Beachwood, OH 44122







Building Information Input		
Project Name	Capital Grounds	
Building Area	18,000	ft ²
Air Leakage Flow Factor	20	
Air Leakage Wind Factor	3.25	
Effective Air Leakage Area	10.00	ft ²

Weather Data		
City	Olympia	
State	WA	
Heating Degree Days	5531	HDD
Cooling Degree Days	97	CDD
Peak Entalpy	32.6	Btu/lb
Weather Heating Season Factor	201.27	KBtu/cfm-yr
Weather Cooling Season Factor	0.84	ton-hr/cfm-yr
Peak Cooling Capacity Factor	0.0026	ton/cfm

Energy Calculations			_
Quanity of Air Leakage	650	cfm	
Additonal Heating Energy	163,531.5	KBtu/yr	4,631 m³/yr
Additional Cooling Capacity Required	1.72	tons	
Additonal Electric Usage	684.2	kWh/yr	
Peak Electric Demand Impact	2.16	kWD/month	
Project EUI Improvement	9.21	Kbtu/sf	

Energy Formulas

Air Leakage (cfm) = Flow Factor * (ΔP)n * Leakage Area

Additional Heating Energy (KBtu/yr) = Air Leakage * KBtu/cfm-yr / efficiency

Cooling Capacity (tons) = Air Leakage * (ton/cfm)

Cooling Electric Usage (kWh) = Air Leakage * (ton-hr/cfm-yr) * Cooling Efficiency (kW/T)

Peak Electric Demand = Additional Cooling Capacity (tons) * Cooling Efficiency (kW/T)

Utility Cost Data		
Electric Utility Unit Costs:		
Electric Demand Cost	\$0.00	\$/kWD
Electric Usage Cost	\$0.10	\$/kWh
Natural Gas Supply Costs:		
Natural Gas Cost	\$9.84	\$/MMBtu

HVAC System Data		
Heating System Type	Standard Boiler (Standard Flue)	
Heating Efficiency	80.0% %	
Cooling System Type	Air Cooled w/ Condenser	
System Efficiency	2.80 COP	
	9.55	EER
	1.26	kW/ton

Total Energy Savings		(+746 (insulation savi
Total Energy Savings	\$ 2,422.75	
Heating Savings	\$ 1,609.15	\$/yr
Electrical Savings	\$ 67.60	\$/yr
Savings/square foot	\$ 0.13	\$/sf

Project Costs		
Cost to Rectify Air Leakage:	\$ 74,40	3.00 (\$)
Simple Payback	30.71	Years

Greenhouse Gas Emissions		
Heating Reduction Equivalency	8.18	MT of "CO2"/yr
Electric Reduction Equivalency	0.47	MT of "CO2"/yr
Combined Total	8.65	MT of "CO2"/yr
(*) 1 110 504		NAT NA T

(*based on US EPA conversions)

MT = Metric Tons